PSYCHOLOGY IN EDUCATION

By

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PREFACE

This textbook is addressed to senior-college and graduate students and teachers. It provides a psychological treatment of practical problems in education and a systematic exposition of psychological data basic to education. Broadly speaking, it treats the educative process. Throughout, it is concerned with the practical. It also gives mature consideration, supplemented by experimental investigations and historical background, to various psychological phenomena that are basic to critical reflections about educational problems. So much has been said in education about laws of learning, transfer of training, motivation, schools or systems of psychology, and other topics of lesser scope, and especially since much that has been said is equivocal, it behooves us to gain some scholarly understanding of them. One can become an electrician without much knowledge of mathematics or electricity. To become an electrical engineer is another matter. Artful practice alone does not make a profession, be it in medicine, the law, or teaching. Also required is a substantial fund of organized knowledge basic thereto.

Source materials have been drawn rather liberally from investigations made in school situations, as well as those conducted in psychological laboratories. It is significant that experiments of the psychological laboratory and those conducted in class-room situations are mutually supporting. It has been the writer's experience that teachers and teachers in training have more confidence in the applicability of psychological findings to education when corroborative findings have been obtained under class-room conditions.

This book contains a considerable body of data drawn from sociology and cultural anthropology. To an extent it may be said to be written from a sociological standpoint and to represent an approach to a social psychology of education. Such data enrich our knowledge of the social processes of education, motivation, the conditions of mental development, and of human behavior — habit, thought, and feeling — as determined by

the cultural heritage To this source we turn for information on the effect of class, race, and kindred factors upon education

The volume provides a treatment of the *development of the human mind,* or, at least, an account of how experience – the cultural heritage, the educative process, etc – contributes to this development *Mental development* is, or should be, the central theme of educational psychology An attempt has been made to show how, and the extent to which, mental development is fostered by education Mental abilities do not, like Minerva, spring full-grown into being They come about as a process of growth and development Mental growth is not characterized by *stages* All the mental processes appear to be present in young children We do not have to await the attainment of a given developmental level before introducing reasoning, for example, in our schools There is not one stage in which to specialize in the acquisition of factual information and another in which to cultivate critical thinking

Considerable space is devoted to the psychology of basic school subjects A chapter is assigned to reading, a substantial portion of a chapter to language and number Discussions of such topics as the thought processes, critical thinking, cultivation of the higher mental processes, guided learning, retention of what is learned in school are especially appropriate to the social studies and science

In the preparation of a textbook one is obligated to many persons The writer wishes to acknowledge special indebtedness to Professor Ernest Horn, for many critical suggestions, and to Doctor Henry Smith and Miss Ava Van Duzer, for valuable assistance in the preparation of the manuscript

JAMES B STROUD

Iowa City
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CHAPTER I

THE EDUCATIVE PROCESS

SCOPE AND FUNCTION OF EDUCATION

Taken in its broadest sense, not in the narrow sense of schooling, education is the process by which societies perpetuate or renew themselves, or, perpetuate themselves by renewal As surely as the maintenance of the species depends upon renewal by reproduction, so surely does the maintenance of societies depend upon renewal by education Indeed all life, whether it be the life of societies or the life of a crustacean, maintains itself by renewal Dewey has made this the distinction between animate and inanimate things [1]

Education is, or certainly may be, more than a mechanism of maintenance of societies, it is, or may be, a means of their growth Maintenance insures the growth of the constituent members up to a certain point, but not the growth of society When there is in a succession of generations no change in society, there is no aggregate change in its constituent members In a society that is merely maintaining itself, education's work is rather easily accomplished, for reasons we shall see later, provided there is an absence of caste or other forms of social stratification

All peoples now living, and all those of the past of whom we have any record, live by arts passed on by education from generation to generation The mental development of a people is closely correlated with, and seems to be conditioned by, their cultural development Education is as necessary to one's becoming a savage as it is to his becoming a worthy member of the most cultivated society As Dewey has suggested, it would appear that, in a sense, savage mentality is an effect rather than a cause of their savage culture Perhaps each is cause and each effect, but there is no pressing reason to believe the savage

[1] J Dewey, *Democracy and Education* New York Macmillan Co, 1916

incapable of high intellectual attainment, should his culture provide the proper stimulation and educational means of development It is reasonable to suppose that the difference between savage mentality and our own is owing to differences in education, in its catholic meaning The life of societies is not maintained by preserving the members merely in a physical sense, but by initiating the immature members "into the interests, purposes, information, skill, and practices of the mature members Beings who are born not only unaware of, but quite indifferent to, the aims and habits of the social group have to be rendered cognizant of them and actively interested" [2] Not only does the perpetuation of society depend upon *transmission* quite as much as does perpetuation in a biological sense, but the mental characteristics of the people at any given time are dependent upon what is transmitted culturally just as surely as their morphological characteristics depend upon what is transmitted biologically (*cf* Chapter III)

In still another way we may see how education contributes to mental development Education takes place when the world from without and the world from within meet It is not as if the occurrences, sequences, and laws of nature were merely impressed upon the mind through the portals of the senses Were such the case the best educated men would always be those who have the best mental organs or the best senses or who live where natural phenomena are in greatest abundance, rather than those who have the richest cultural heritage Education changes and, indeed, largely fashions the "world within" The world has no meaning save that ascribed to it by man By this we see how the meaning of the world and universe and all things therein has changed down through the ages as the mind of man has been changed by the floodtide of culture Education has thus provided new worlds upon new worlds People are educated by other people, by the ideas of other people, and by the impact of their culture The same brilliant and beneficent sun shone down upon the peoples of the Nile for thousands of years before the sun god worship took hold of Egyptian minds It was not the sun but the idea that

[2] *Ibid*, p 3

thus supplied the man of the Nile with the first form of religion known to the races of man

EDUCATION IN PRELITERATE SOCIETIES

Perhaps we may the better understand the process and function of education by first scrutinizing the conditions under which the cultural achievements of preliterate peoples are transmitted to the immature members of their societies In the most primitive of preliterate societies all education is informal in the sense that there are no schools and no teachers in the accepted usage of those terms Much of it is incidental in the sense that there is neither intention on the part of the elders to teach nor on the part of the youth to learn (*cf* Chapter XI) There is living together and participation in activities Some of these activities satisfy bodily needs and are, therefore, their own warrant, others, such as ceremony, ritual, taboo, magic, warfare, and the like are re-enforced by the highest social sanctions and are likewise accepted by the youth as being of the greatest worth In these processes of social interaction the youth learn the activities of the group Indeed these are the most natural and effective conditions of learning There is purpose in the activities – purpose that is very real to the youth – though they need not be conscious of the fact that their participation in them is a means of learning

There may, of course, be a good deal of purposeful tutoring by parents or elders, even in such primitive arts as the shaping of a stick for digging roots and bulbs or the making of fire, or in marriage rites, counter magic, and the propitiation of ghosts of the dead But in all cases there is the condition not of participating for learning but of learning by participating in activities that are, so to speak, their own end

In a superficial sense it may be said that the youth learn by imitating their elders, but imitating is not the end, not the motive They imitate, *i e*, act like their elders, in order to accomplish the same end, or as a technique of becoming like them by identification, not to satisfy an innate urge to imitate Imitation serves to provide a method, a cue Imitation becomes a technique whereby motives are satisfied, and thus

assumes a place of importance along with other adaptive responses The truth of this may be seen in a fact which we shall have occasion to mark in the following chapters, namely that cultural transmission does not take place merely because of symbiosis, but requires the further condition that there be interaction, free play, as in face-to-face situations

This kind of informal learning is not confined to preliterate folk but takes place in every society Indeed it provides the first and most important educational channeling of our own youth – without which there would be no basis upon which to start the formal instruction in our schools However, among primitive people, this is the most important and sometimes almost the sole medium of instruction In certain African cults surviving among the Negroes of Brazil, as the *candomblé* or fetish-cult ceremonies, instruction in ritual and belief may be carried on informally by participation with relatives and friends [3] This informal instruction extends to traditional dances, music, costumes, and other forms of ritual Through this medium the young are taught the ways of the tribal life On other occasions formal instruction in the cult may be provided by sacred specialists For ceremonial dancers (daughters of the orixás) is provided very rigorous training lasting from a few months to a year Their training is circumscribed by ritual and carries great prestige

The Russian serf of by-gone days, as he cowered before the arrogant nobility, or sought to fend himself against physical violence, taught his children attitudes of servility more effectively than could have been done by the best formal instruction By this informal way, we may surmise, the Negro youth in America unfortunately "learn their place" and would do so without any purposeful instruction upon the part of either the whites or the Negroes

The West African "bush" school In the West African "bush" school we find at the preliterate level a highly formalized school [4] The school is set apart as any school for highly

[3] D Pierson, "The Educational Process and the Brazilian Negro," *American Journal of Sociology*, 1943, Vol 48, pp 692–700

[4] M H Watkins, "The West African 'bush' School," *American Journal of Sociology*, 1943, Vol 48, pp 666–675

specialized instruction must be, although the educational activities are much more closely correlated with the purposes they serve than is the case in our schools The values are more immediate and personal The sense of personal responsibility of the learner is likely to be high, inasmuch as the end has social sanction and great prestige and the means is readily understood, *i e*, perceived to be appropriate to the end

To begin with, the school amounts to a kind of secret society, separate societies being maintained for boys and girls Training is a prerequisite to acceptance as a worthy and responsible member of society, as an initiate The schools are held in special sections of forests set aside for the purpose The length of the school varies from a few months to several years Once a pupil has entered the premises he may not on any account leave until his schooling is completed Only the initiated may enter the area The principal figure in the boys' school is a leader of great mystic power and prestige He commands great respect not only among his pupils but also among the chieftains and elders of the tribes He is well versed in "native lore, arts and crafts," and "in the history and traditions of his people" [5] He is assisted by a number of specialists in the various fields of instruction On festive occasions the principal robes himself in costumes of great splendor Upon his arrival in a village all the uninitiated must remain behind closed doors

Upon entering the forest the boys, under the tutelage of their teachers, erect the village that is to house them during the school term (this is burned at the close of the term) They maintain the buildings, till the fields, and receive instruction in the various arts and crafts of tribal life, as well as training in the art of warfare and in various sports and other forms of recreation and in hunting Instruction is also received in family and tribal life, including etiquette, tribal laws and traditions, the art of healing, and religion and ceremony Thus while the "bush" school is set apart from the normal life of the village and the chiefdom, this life is in large measure recreated, with the result that the values retain much of the personal aspect of informal education

[5] *Ibid.*

When the term of instruction comes to an end and the school and the accomplishments are inspected by representatives of the chief, the boys return to the village amid great pomp and ceremony, lasting altogether several days They are lavished with gifts and are permitted special privileges Afterwards they return to their homes with full privileges of citizenship and even new names by which they are ever afterward known to the initiated – all of which serve to bestow social sanction upon the schooling Suffice it to say that similar schools are maintained for girls, with instruction appropriate to their walk of life One cannot escape the reflection that from the West African point of view these schools must surely be remarkably efficient

Midwestern highlands of Guatemala We shall sketch some of the features of education in the midwestern highlands of Guatemala, as described by Redfield, communities which are as he says intermediate, in many respects, between "the simple tribe and the modern city" [6] These communities have formal education as provided by schools, and the informal education of myth, legend, and ceremony, but neither type is of any great force In reading Redfield's article one gathers the impression that here there is no great enthusiasm for reading, writing, and arithmetic – the principal content of the curriculum Perhaps this is so because the schools play a minor role in perpetuating the culture of these societies "Except for the texts of prayers recited on many occasions, little of the rural Ladino heritage depends on literacy" Few opportunities present themselves for the turning of literacy to any social account In comparison with our own societies, literacy has little prestige On the other hand, ceremony, ritual, and religious lore have no great hold on the people

In so far as the effective elements of instruction go they seem to be derived from informal, incidental learning and teaching This is as true in school as in the home and in the casual associations of people There exist two cultures in these communi-

[6] R Redfield, "Culture and Education in the Midwestern Highlands of Guatemala," *American Journal of Sociology*, 1943, Vol 48, pp 640–648

ties — the Indian and the Ladino The latter comprise a minority group of Spanish speaking people of mixed racial stock Although largely Indian in race, the Ladinos have maintained certain elements of Spanish culture In the schools the Indians learn to speak the Spanish language, though it is not one of the subjects of the curriculum, and tend to adopt Ladino dress and customs The Ladinos also are influenced by Indian culture Here we find the school fostering the amalgamation of two cultures, but doing so quite over and above formal instruction or any other function of the school as formally rationalized Here the school as a social group is of considerably greater importance than the school as a formally organized institution for the teaching of reading, writing, and arithmetic

While in American schools the curricular content is of much greater importance than in the midwestern highlands of Guatemala, we may find, as an extremely important function of the school, similar processes of acculturation, notably between the immigrant and native-born youth This is especially true where dissimilarities in cultural level, or racial, religious, and national prejudices, are not so great as to constitute a barrier to group interaction (*cf* Chapter III)

Despite the fact that the schools, save as they function as informal social groups, are of comparatively little consequence, and that there is no very systematic body of totemic culture transmitted by ritual and ceremony, these societies do perpetuate themselves by educative processes and show some evidences of growth Perhaps it may be allowed that this Guatemalan society is favored by the absence of systematic and rigid totemism — a condition that frees a society from the fetters of the past — without at the same time having replaced it with positive conditions that make for any very great advancement Fortunately, we are here permitted to see certain educative processes at work which might well be covered up by other and more potent processes, as in the more formalized indigenous culture of Africa or Australia or in our more elaborate and effective system of formal education Thus we may see here more clearly than in most instances that the *process of educa-*

tion is chiefly one of communication, as beliefs, superstitions, customs, and information are presented, reacted to, confirmed, denied, modified, and passed on by word and gesture as a process of social interaction – without there being set aside any time or place for instruction Imagine a scene outside a house in a certain village

"Six men and two boys stand around a little fire and talk Someone compares the heaping-up of pine cones made ready for this fire to the heaping-up of twigs by Indians at certain places on hilltops where, by Indian custom, the traveler strokes away the fatigue from his legs with a twig and then adds the twig to a growing pile As soon as the comparison has been made, one man of those beside the fire expresses derision at this Indian belief, which is well known to all present Others briefly indicate similar disbelief in the custom Another man then makes a remark to the effect that what does in fact serve to relieve tired legs is to rub rum on the ankle-bones A younger man – apparently unfamiliar with this remedy – asks how this can be effective, and the older man explains that the rum heats the nerves that run near the ankle-bone and that the heat passes up the body along the nerves and so restores strength The explanation is accepted, the apparent physiological mechanism provides a warrant for accepting the worth of rum as a remedy

"After a short period of silence, conversation begins about snakes, one man having recently killed a large snake A young boy, apparently wishing to make an effective contribution to a conversation in which he has as yet played no part, remarks that the coral snake joins itself together when cut apart The man who laughed at the Indian belief about tired legs scornfully denies the truth of the statement about coral snakes Another older man in the group comes to the support of the boy and in a tentative way supports the truth of the belief as to coral snakes A younger man says that it is not true, because he cut apart such a snake without unusual result The skeptical man appeals to the company, another witness offers testimony unfavorable to the belief The boy has not spoken again, the other man who ventured to support him withdraws from the argument But this man wishes, it seems, to restore his damaged prestige With more confidence he offers the statement that some animals *can* do unusual things the monkey, when shot by a gun, takes a leaf from the tree in which he is sitting and with it plugs the wound The smaller of the two boys, who has not yet spoken, adds that the jaguar can do this also Discussion breaks out, several persons speaking at once, the trend of the remarks is to the effect that, although undoubtedly the monkey can do as described, the jaguar is

unable to do so The quick statements of opinion break out almost simultaneously, and very quickly thereafter the matter is dropped The bystander recognizes that there is substantial consensus on the points raised, the boy is apparently convinced " [7]

It is, of course, a matter of speculation as to the amount and kind of education mediated by the foregoing conversation No one would contend that such a conversation would settle the matters at issue, but it seems inevitable that something of educational significance did result Standing by itself it would not amount to much, but when encompassing many groups in many generations and touching upon many topics the total effect of such forms of intercommunication must surely be of considerable educational consequence For the eight persons present the conversation probably added some small bit to disbelief in the power of coral snakes to join themselves together again and in the restorative powers of the twig ritual and in the jaguar's habit of treating its wounds On the other hand it is likely that the conversation had the tendency to add credence, at least to a degree, to the restorative powers of rum and in the monkey's habit of treating its wounds Should those present, singly or collectively, find themselves in company with other men and should conversation run to these same topics they would by virtue of this previous conversation tend to be more skeptical than they otherwise would have been relative to the theses respecting coral snakes, the twig ritual, and the jaguar, and more affirmed in their opinions relative to the propositions stated about monkeys and rum

Spontaneous learning One of the salient aspects of the kind of learning we have been considering up to now is its spontaneity Examples of the things the youth are expected to learn are everywhere present, examples that are re-enforced by social sanctions Here, as Mead has said, learning, not teaching, is in the fore The learner is in a position of seeking to learn something rather than being faced with a situation in which a teacher wishes to teach something – something which the learner does not of his own accord seek out, as is so often the case in our schools " There are several striking differences

[7] *Ibid* Reproduced by courtesy of the author

between our concept of education today and that of any contemporary primitive society, but perhaps the most important one is the shift from the need for an individual to learn something which everyone agrees he would wish to know, to the will of some individual to teach something which it is not agreed that any one has any desire to know"[8] While this statement is not entirely true – tens of thousands of American children are probably as desirous of learning to read as the Eskimo children are of learning to spear fish or chew boots, the point is well taken and may stand as one of the fundamental differences between the formal learning in our schools and the informal learning in contemporary primitive or highly cultivated societies

Indeed one does not have to go to the South Seas to observe instances of spontaneous learning The advantage in doing so is that there where formal schooling is very largely absent we may the more clearly see the force of education as fostered almost solely by interaction in primary groups Education of this kind goes on in our modern homes and communities and in our schools We could, by abandoning our schools and otherwise desisting from teaching our children anything which they did not first wish to know, or trying to create desires for learning which did not well up out of their own social life, rival preliterates in their education, save for the fact that our customs are not re-enforced to so great an extent by the coercive power of ritual and ceremony We would of course gradually return to tribal conditions We cannot avoid the observation that primitive education, which is sometimes held up as an ideal worthy of our emulation, does not produce civilized people, whereas our "inferior" kind does It is by teaching children things most of them do not wish to know – or *did* not wish to know as a natural consequence of their own social life – that we have raised the whole cultural level of mankind

The only practical choice we have, it seems, is to continue along present lines, of course doing a more effective job whenever possible, or providing separate educational programs for

[8] M Mead, "Our Educational Emphases in Primitive Perspective," *American Journal of Sociology*, 1943, Vol 48, pp 633–639

the various cultural elements of our society such that the instruction provided for the pupils in each element would be commensurate with the normal desires that grow out of their cultural status The latter procedure is in some respects defensible, psychologically At least it is consonant with the condition that learning proceeds best when there is spontaneous seeking to learn, and when the instruction is adjusted to the cultural advancement of the people However, such a program would almost inevitably accentuate social stratification in our national life and would tend to lead us more definitely toward a caste system This is a question for educational philosophy, and is not to be settled entirely upon psychological grounds

Even so, the issue raised by Mead cannot be easily set aside It brings to focus the smooth efficiency of informal learning There is no thought that we should abandon formal instruction, for the very existence of our schools is proof of our recognition of the fact that many things can be better taught formally than informally In fact it may be argued successfully that formal, systematic instruction is quite superior to the informal kind But the latter, as a natural consequence, capitalizes on some of the conditions of learning more effectively than the former Perhaps, by determining those conditions that make informal learning effective, we can apply some of them to formal learning

The question is to what extent our educational aims, nationally considered, are compatible with a procedure based upon spontaneous desires to learn In preliterate society education serves to perpetuate the society and preserve it against change One of the functions served by ceremony and ritual is to keep out interlopers, just as the formal rules of etiquette and correct speech and dress preserve polite society from inroads by the uninitiated Our educational aims are not merely to preserve and perpetuate the social heritage, but also to advance and to raise the whole cultural level of society by extending our cultural products to all the youth – many of whom are admittedly not ready for them in the sense that they go out seeking them Obviously this procedure creates dislocations and must operate against great difficulty The task of transmitting culture to

groups that have little or no spontaneous interest in it is a difficult one

Our choice is one between awaiting the slow processes of acculturation and providing schools to teach only that which is sought by the pupil, or proselytizing, *i e*, *providing persons with a zeal to teach that which the great majority have no spontaneous desire to learn* Of course we try to create the desire to learn, but this is proselytizing To do a very inefficient job of schooling people who by reason of the culture lag are lacking in interest in it may be better than passing them by

What does it mean to have a spontaneous interest in learning – to have a condition in which the learner seeks to know as opposed to one in which someone seeks to teach something the learner does not wish to know except as he is motivated by extraneous devices? Let us first see what it is not It is not a natural interest, like appetite, which people everywhere have because they are people It does not pertain to any fixed content that is alike for all people Spontaneous interest in learning comes about as a resultant of a particular set of cultural forces operating in a particular social situation In one such situation the desire to learn to read the vernacular may be quite spontaneous, and in another entirely lacking Interests are not spontaneous because they are primitive, although in primitive society education is largely limited to spontaneous interests The latter circumstance certainly makes for an easy-running *process*, while the *results* achieved by our system are incomparably superior – at least from our standpoint

Our youth not only become indoctrinated with a contemporary culture vastly more complex than that of the Bushman or native Australian, but they gain a fair knowledge of the culture of all ages Redfield has noted that "In comparison with the educational effect of a *katchina* dance upon a Hopi child, a chapter in a civics textbook seems pretty thin, educationally speaking"[9] Of this there is no doubt But civics and other subjects of its kind poorly learned is of vastly more worth, educationally, than the *katchina* dance and all its kind in Hopi cul-

[9] *Op cit*

ture well learned, if, of course, it be admitted that intellectual development is desirable – which after all may be debatable

ON INDOCTRINATION

In a very general sense all education may be thought of as a process of indoctrinating the members of a society with its cultural heritage But when the society is a homogeneous one and membership in it hereditary, there is no indoctrination in the sense of proselytizing or winning converts There is a minimum of proselytizing in primitive societies Wherever other cultures are known to primitive people, there most likely exists a belief in the superiority of their own culture This would seem to be necessary to prevent encroachment If this is so, we may suggest that a plausible reason why proselytizing is not everywhere present is that membership is regarded as hereditary (The idea of superiority may not actually be present, though it is difficult to see how it could be otherwise) A notable contemporary illustration is at hand in the case of the Jews, on the one hand, and Catholics and Protestants, on the other The latter everywhere send out missionaries – sometimes to the positive degradation of the people converted – and otherwise engage in recruiting In so far as the writer knows, these practices are not engaged in by the Jews – perhaps in part at least for the reason that membership is largely hereditary

Wherever the idea of superiority becomes fixed in the thinking of a people – superiority of beliefs, dogma, and other cultural elements, or superiority of one cultural stratum or class as opposed to another – active indoctrination occurs, except where the idea of birthright is involved " wherever this notion of hierarchical arrangements of cultural views of experience appears, it has produced effects upon education, and it has enormously influenced our own attitudes toward education "[10]

The dominant note in education in America, in so far as it has become articulate, has been the use of schools as instru-

[10] Mead, *op cit*

ments for producing change, rather than for maintaining the *status quo* This would seem to be inevitable in a society that is making rapid growth (or change) In America, in particular, schooling has been looked upon as an opportunity for moving from one social stratum to another As is seen from the foregoing discussion, education, when put to such use, encounters certain obstacles In our own country we have had to contend with social stratification – which, by the way, has not been so severe as in many other countries, and with large immigrant and Negro populations

To the extent that the desire for change has been present upon the part of the people so affected, and to the extent that schooling has been seen clearly by them as a plausible means to this end (perhaps at best this is usually seen only in the most general way), conditions have been favorable to the dissemination of knowledge by the schools To this extent, at least some of the conditions of seeking to learn have been operative, and the recipients have not been indoctrinated against their will

On the other hand, there are very large numbers in the school population who are expected to learn things they see little use in and the need for which does not grow out of their own social situation These elements, as seen in Chapter XII, do not take well to schooling Moreover, by virtue of various kinds of exclusion or social isolation (*cf* Chapter III), and consequent interruption of communication, the informal educative processes as mediated by social interaction do not function well

Public elementary schools were made free (tuition free) in 1881 in France, in 1888 in Prussia (they had been free to the poor since the time of Frederick the Great) In England the elementary schools were made free to the poor in 1870, were pretty largely made free to all in 1891, and entirely free in 1918 For the most part they have been free in America since Revolutionary days Compulsory school attendance laws were enacted in Massachusetts in 1852, and all the other 47 states had enacted similar laws by 1918 Such laws are in existence in various other countries

Here we have clear cases of certain social strata dictating the

education of other strata For millions of children this has meant schooling which they did not want Today going to school has such a degree of social sanction that these compulsory attendance laws are of comparatively little social consequence, except for truants, yet many of the old elements still prevail, in that the cultural background of a large percentage of the children neither produces a spontaneous desire to learn much of the content of the curriculum nor supplies them with the preliminary education with which to do so We have not been content to teach children to think, feel, and act as their fathers did We have aimed, at least for most children, to improve upon paternal attainment This has led to progress, but it has also aggravated our difficulties Instances in exaggerated and unmistakable form are seen where missionaries have gone and in nearly all the plundering of native populations by the white man Another example was our government's practice of segregating Indian children in boarding schools We may surmise that there was little in native Indian life to serve as a background for the instruction imposed upon the Indian youth, and still less to lead to a spontaneous drive toward this instruction In fact their early and very potent formative training may have operated in some respects as a distinct disadvantage It is not surprising that they made slow progress in the mastery of instruction, or that upon reaffiliation with tribal life they "returned to the blankets" The white man's culture was of little use in Indian culture, and had the Indian persisted in it the result would have been social ostracism [11]

In the imposition of western culture upon Africa the dislocations have been exaggerated by teachers who have, in most instances, been missionaries This has meant zeal for propagating a new religion and with it a new family and social life and moral values, as well as new schools Also commercial interests added a new economic system [12]

[11] S Mekeel, "An Anthropologist's Observations on Indian Education," *Progressive Education*, 1936, Vol 13, pp 151–159

[12] B Malinowski, "The Pan-African Problem of Culture Contact," *American Journal of Sociology*, 1943, Vol 48, pp 649–665

Man lives in his culture, for his culture, and by his culture To transform this traditional heritage, to make a branch of humanity jump across centuries of development, is a process in which only a highly skilled and scientifically founded achievement of cultural engineering can reach positive results [18]

When, as in Africa, barriers are raised which exclude a minority group from the most important rights and privileges of the majority group, conditions become particularly violent The American Indian probably had little enough interest in European culture, but the color line has been only loosely drawn, as seen, for one thing, by the fact that Indians with white blood tend to be accepted by the white caste, pretty much as is the case with Negroes in Brazil Whereas, in Africa, as in America, a white person with any known amount of Negro blood, even when it is not obvious, is classed as a Negro, and therefore subject to social exclusion

Education does not grow in barren soil Transculturation does not take place because of physical proximity, but because of free social interaction And the more formal education of the school does not always have the beneficent influence claimed for it Schooling alone, even were it well done — and it is never well done when it is too much out of step with the other aspects of culture — cannot elevate a people to any great degree Seeing that highly civilized people are well schooled, we are wont to look upon schooling as a sufficient means of raising subjugated preliterate peoples to the plane of living of the dominant group Schooling is certainly one of the means, and a necessary one, but not a sufficient one But thought and opportunity are requisite also In a superficial sense schooling does seem to work wonders among our immigrant populations But upon closer examination we see that the wonder is worked not only in proportion to the amount of schooling obtained but also in proportion to the extent to which they are accepted by the majority group and for the immigrant, schooling is a means to fuller acceptance

On the other hand, the American Negro youth is not accepted, for the most part, even when he attains a level of

[18] *Ibid*

culture achieved by white youth In addition to his being thus denied one of the most potent educational factors — free social interaction, he does not have the same birthright and opportunity He is not better off for having received schooling to anything like the degree that the immigrant youth is, to say nothing of the non-immigrant white youth, except from the enhancement of his prestige in his own group

Thus, while schooling is our greatest means of changing social and economic conditions, it is not enough The American Negro, it seems, must live in the white man's culture He cannot to any great extent develop an independent culture, as perhaps many Africans still could do It cannot therefore be said that the white man's schooling is of no worth to him But at the same time there are severe limits placed upon its worth Any thought that schooling alone can be a means of greatly changing his status is chimerical Malinowski's suggestion that for every pound or dollar spent on training the African ten "should be budgeted for the improvement of native conditions of life, for the purchase of more soil for the native, and for the creation of opportunities in manual and intellectual work, of which the Africans are now almost completely deprived," [14] is certainly appropriate to the condition of the American Negro Character is shaped by opportunity much more than by physical proximity

From the standpoint of efficiency in learning, and from the standpoint of immediate practical value to American Negroes, much could be said for a special, realistic type of education adapted to their needs as they at present exist, although the over-all effect would be undesirable, as it would tend to perpetuate the race-caste system This is predicated upon the assumption that they would readily accept it, which is doubtful As much could be said for white children in certain social and economic strata This has been done to a considerable degree in various European countries In fact some change has already occurred in this direction in America This may be all to the good, but it tends to veer away from traditional American democratic doctrine of education If carried to any great ex-

[14] *Ibid*

tent it would almost certainly have the effect of accentuating social stratification At the same time there is little doubt the educational processes would operate more smoothly under such a regime Perhaps a very considerable cultural enrichment of our vocational curricula might mitigate some of our ills

INDOCTRINATION AND FREEDOM

As we compare our system of schooling and its comparative lack of freedom and spontaneity in learning with the informal educational methods found in schoolless societies, we are likely to be deceived regarding the relative degrees of freedom of thought and action produced by the two systems It is true that the method of education in these schoolless societies is quite informal, and there is little coercion, save that which stems from the normal processes of social interaction But on the side of educational content we do not find these same conditions The forces that shape the child's mind are rather narrowly laid down and indeed quite rigid It would be difficult to find a more completely fettered human mind, one with less freedom of thought and action, and one less originative, than that of the savage (*cf* Chapter III)

In so far as content is concerned much of the ritual of preliterates is quite senseless and in this respect compares with the rote learning of the schoolmasters of old However it differs in one tremendously important respect — in that when learned it serves a social purpose much more real and vital than did the phrases learned by rote from a book; and its learning is more spontaneous in that its need grows out of what to the learner must appear to be a perfectly natural social demand

Freedom of thought and action is not conditioned solely or even primarily by the character of the motives and incentives to learning It is the content that counts for most A prescribed curriculum and a zeal to teach that which the learner does not spontaneously wish to learn do not in themselves fetter the mind They may be the very means of freeing it We do not assure freedom merely by allowing a pupil to follow his own interests By urging him to learn things he does not wish to

learn we may, to be sure, fetter his mind, or we may lead him to knowledge which he never dreamed existed and free his mind from the bondage imposed by the narrow limitations of his early training Again, it is the functional nature of the training, not the nature of the motives and the incentives, that determines whether he shall be free or not

CONTRADICTIONS OF PRACTICE AND THEORY

Obviously the remedy for our educational ills does not lie in the direction of primitive kinds of education, nor in emulating primitive methods of teaching and learning But in seeing what it is in their methods that make them so effective within the primitive sphere of life we should in so far as is possible utilize the same conditions in our methods and with respect to our content It should be appreciated, at the same time, that some of their conditions are incompatible with our educational aims It is doubtful if any of them can be transferred directly to our formal schooling Perhaps the Parker-Dewey activity-child-centered school (features which, among others, are perpetuated by so-called progressive education) provides the best framework, of any yet tried, for the utilization of the effective elements in the smooth working education of the preliterates (*cf* Chapter XVI) The unit plan of instruction, when considerable care is given to the assignment for purposes of delineating the problem and making clear the nature of the tasks to be executed and in vitalizing them is also a step in this direction — especially the co-operative assignment, as is also the socialized recitation It is important to create and keep alive in our classrooms the social spirit of working together at tasks that are made to have social value to the pupils (*cf* Chapter XIII)

It is not because activities are steeped in tradition and ceremony or coupled with social sanctions and the necessities of life that they are so learnable It is rather that these conditions foster an eager and spontaneous desire to perform them, and when performed lead to satisfying results The reasons for performing the activities are contained in the activities, not extraneous to them Our need is to provide conditions that lead

to interests – spontaneous where possible, but at least interests – in performing activities that lead to the learning of things our youth should learn

Obviously the realization of this is difficult to achieve because our educational needs are so great and many of them so remote to the young learner at any point in his educational career Owing to the nature and complexity of our economic life, a youth usually sees but little of the activity of adults for which he himself may be preparing Most of the adult occupations are outside the home and frequently do not come within the youth's observations Much of the young learner's education has as its purpose the mastery and preparation for mastery of the tools of civilization – whose meanings are ordinarily inadequately comprehended by him The social life of the great majority of young children in our society does not serve to create a spontaneous interest in much of the subject matter of our schools, and in many cases does not even serve as an adequate introduction to it We cannot wait for the pupil to develop a spontaneous interest in things whose very existence has never occurred to him and whose need in adult life is equally remote Frequently we are in a position of having to teach a pupil a good deal about an activity before he is in a position to have an intelligent interest in it Thus a good assignment, often, is one that supplies enough preliminary knowledge to provide a basis for further interest

It is, notwithstanding these difficulties, of the greatest importance that interests in the activities of the school, interests strong enough to sustain the activities, be developed There should be a need – as has been said, a strongly felt need – on the part of the pupil, although this need as experienced by the pupil may not be the same as his ultimate educational needs broadly considered It is unlikely that the child has much conception of his ultimate educational needs or that he would be much moved by them if he did have The needs must be appropriate to his life here and now as he finds himself in a social situation [15] This problem is the subject of further dis-

[15] *Cf* E R Embree, "The Educational Process as Applied in America," *American Journal of Sociology*, 1943, Vol 48, pp 759–764

cussion in later chapters This doctrine is not new – it is at least a half-century old – and the fact that so many of our schools are far from having realized its objectives, despite its wide acceptance in theory, should tell us that it is not easy to implement

THE SOCIAL BASIS OF EDUCATION

Socialized anxiety As a starting point we may make use of Locke's asseveration that "love of credit and apprehension of shame and disgrace are of all others the most powerful incentives of the mind, once it has come to relish them" – or in the words of Mowrer, once there arises *anxiety* about them [16] This type of anxiety has been appropriately termed socialized, because, first, it is acquired, primarily, in social situations, and, second, existing patterns of social behavior largely determine the situations about which anxiety will be felt Educationally, the latter point is of the greatest consequence because it gives course to the processes of mental development We may assume that anxiety arises as a natural consequence of mental development – not as a biological unfolding, but as a process of learning and thinking

The reactions toward pleasant and unpleasant consequences – reward and punishment – being what they are it is inevitable that intelligent beings would develop some anxiety about them Once the individual becomes concerned about the evaluation others place upon his conduct a new and vast field is opened up for the play of anxiety motives Solicitation about social approval and disapproval becomes the most pervasive of human motives This source of motivation may, as we shall have occasion to see later, take precedence over the biological or primary motives In any case socialized man does not satisfy his biological urges in the direct way an animal does but does so in accordance with social sanctions

As we shall see later, especially in Chapter VII, there are biologically determined affective and emotional reactions These reactions may be presumed to form the basis of anxiety,

[16] O H Mowrer, "Anxiety Reduction and Learning," *Journal of Experimental Psychology*, 1940, Vol 27, pp 497–516

but, while thus being necessary to anxiety, they are not sufficient Anxiety requires a certain amount of mental development through experience, a certain amount of insight Socialized anxiety requires a consciousness of and concern about the evaluation of one's behavior by others Davis has recently defended the thesis that socialization depends upon "the degree of *adaptive*, or socialized, anxiety which has been installed" by society "It is believed that the proper level of such socialized anxiety acts as a necessary push toward the attainment of the required cultural behavior, and through such attainment, to approval, prestige, and security in the group" [17]

Education and class We have already seen how the nature of a person's education varies with the type of society in which he is reared (This fact is emphasized further in Chapter III) This is true first because the sources of education — tools, institutions, customs, organized knowledge, and the like — vary from one society to another It is also true in a second and equally important, and more dynamic way, namely that the type of society conditions the ramifications of socialized anxiety As we have already seen the Indian of the western highlands of Guatemala feels little anxiety about the formal elements of the schools in the Ladino culture We may surmise the rewards and punishments in his life are of insufficient strength to lead to an effective level of anxiety about the three R's The matter is quite different with respect to the customs and informal elements of Ladino culture We shall now have occasion to see how these same dynamic factors work themselves out in the educative processes within different social classes in our own society

The fact of social rank in America, even though less rigidly defined than in many other countries, is a matter of great educational consequence This matter is discussed at some length in Chapters III and XII Suffice it here to point out that dif-

[17] A Davis, "Socialization and Adolescent Personality," *Adolescence*, Forty-third Yearbook, Part I, Chapter XI, National Society for the Study of Education Chicago Department of Education, University of Chicago, 1944

ferences in social rank within a society have the same kind of educational significance that differences between societies have Again, this is true in the sense that different social classes provide different models of conduct and thus provide different educational opportunities, it is also true in the sense that different social classes create and foster socialized anxiety with respect to different things, inasmuch as the social sanctions are different As is seen in Chapter XII, lower class youth do not display any great anxiety about securing a high school education In some occupational groups, from a half to two-thirds of the pupils discontinue their schooling when it becomes legally possible for them to do so We may surmise that in their set the rewards and punishments with respect to a high school education are not strong enough to engender sufficient socialized anxiety to stimulate further study

If the matter could be solved merely by providing everywhere acceptable models of conduct the question of social class would not be so serious educationally The educative process is much too dynamic to cause so simple a scheme to work This is why families may live in close physical proximity and be influenced very little one by the other, if they are sufficiently separated by class barriers (*cf* Chapter III) Not only must good models of conduct be present, but behavior with respect toward them must be so re-enforced by reward and punishment — approval and disapproval — as to foster socialized anxiety about the models In this way the youth learn ordinary rules of social conduct, ethical norms, family relationships, economic standards, professional and vocational ideals, and so on for all the ramifications of social life

It should go without saying that different social classes have different standards and ideals Behavior that is tolerated or rewarded in one class may incur social disapproval in another The result is that socialized anxiety develops with respect to different things and, as a consequence, children in different social classes are thus directed in their mental development toward different goals In our public schools we frequently find children from all classes of society in the same school and in the same classroom We should not be disturbed that the

pupils do not have the same standards of social conduct, do not have the same zeal for learning, or do not have the same goals in life Moreover, pupils of one social class do not profit greatly from their social contacts with pupils of other social classes unless they are socially accepted — taken in on the basis of free social interaction, a point emphasized in later contexts Here the school should strive to foster the greatest amount of democracy possible among the pupils — not merely as training for citizenship in a democracy, but to the end that the educative processes will be more complete, especially as the pupils of the lower class come to accept some of the standards and ideals of the higher classes, standards and ideals that were not taught and re-enforced at home There are socially typed goals which are right and proper to a person's status

This same socialized anxiety is the source of much of the pupil's maladjustment as well as the impetus to his triumphs Perhaps it is not too much to hope that greater attention to democracy in the school and the inculcation of a spirit of camaraderie may lead to the mitigation of these ills.[18]

[18] *Cf* J Dollard, "Culture, Society, Impulse, and Socialization," *American Journal of Sociology*, 1939, Vol 45, pp 50–63 B B Gardner, M R Gardner, and M B Loeb, "Social Status and Education in a Southern Community," *School Review*, 1942, Vol 50, pp 179–191 N E Miller and J Dollard, *Social Learning and Imitation* New Haven, Conn Yale University Press, 1941 W L Warner and P S Lunt, *The Status System of a Modern Community* New Haven, Conn Yale University Press, 1942

CHAPTER II

THE BIOLOGICAL HERITAGE

Historically, the philosophy of education, both secular and clerical, has been influenced by the various conceptions which have been entertained respecting the nature of human nature. The word *education* itself shows one such influence, derived as it is from the Latin *e ducere,* to lead or draw out Teaching begins with some conception of what untutored man is like, of what powers, predispositions, and behavior tendencies his biological history has endowed him with

In a former era when the Platonic-Cartesian doctrine of innate ideas was in vogue, the task of education was held to be that of drawing out and cultivating the innate sources of knowledge Locke's *tabula rasa* doctrine, which held mind to be as a smoothed tablet upon which no characters are originally written, placed a different obligation on education, namely that of supplying through sense impression all of the data used in thinking as well as providing training in thinking Darwinian evolution and the biological awakening led to an emphasis upon human *instinct* – inborn behavior and predispositions rather than inborn knowledge Hence, education was to undertake a new kind of drawing out, the culmination of which was seen in the recapitulation and culture epoch theories of a half-century ago (*cf* Chapter XI) Within our own century the emphasis has been upon the cultural sources of human nature The latter lays stress upon the cultural heritage as well as the biological heritage

THE MENTAL ORGANS

We are here chiefly concerned in showing the dependence of mind upon matter This thesis is stated by Herrick, as follows the character of a response is " determined in each case by (1) the action of the exciting agent and (2) the nature of the ex-

cited protoplasm" [1] From ancient times down to the close of the eighteenth century scholars had speculated about the seat of mind, localizing it in various organs of the body — the heart, liver, kidneys, and brain For more than twenty centuries mind was thought to be relatively independent of body Dualism held sway Toward the end of the eighteenth century thinking on this subject began to undergo a momentous change the quest veered from a search for the seat of the mind to that of ascertaining the organs that are responsible for mind — organs that turn out mental phenomena These are chiefly muscles, sense organs, and nerves We may, by tracing their development phylogenetically, follow the development of mental life in the animal kingdom

Muscles In the *Protozoa* we find no permanently differentiated tissue The single cell does all the work of the body Under certain forms of stimulation, a given locality may become dominant and temporary forms of specialization may be assumed Of the three types of cells that concern us here, sensory, neural, and muscular, the first to appear in phylogenetic history, so it is believed, was the muscle cell Authorities have reasoned that while sensory or nerve cells would by themselves be useless, muscle cells would be of some use even in the absence of sensory and nerve elements A primitive type of muscle cells is found in sponges — a phylum just above *Protozoa* — which, in the absence of sensory and nerve cells, are capable of contraction The iris of the human eye is also capable of reacting to "direct stimulation" from light waves In ontogenetic development muscular cells likewise make their appearance in advance of sensory and nerve cells [2]

Sensory cells and their functions Sensory cells make their first appearance in certain of the *coelenterates*, as in the receptor-effector relationship found in the sea-anemone Here we have outlying sensory cells in a direct functional relationship with muscle cells In this relationship, and in the result-

[1] C J Herrick, *Neurological Foundations of Animal Behavior*, p 12 New York Henry Holt and Co , 1924

[2] *Cf* G H Parker, *The Elementary Nervous System* Philadelphia J B Lippincott Co , 1919

ing behavior, we may see the most elementary function of the sensory cell, that of serving as a trigger, so to speak, to release the energy of the muscle cells By virtue of its high degree of sensitivity to changes in pressure, temperature, light, or chemical conditions the efficiency of the organism is greatly enhanced Thus sensory cells, or groups of such cells as found in the sense organs of man and highly developed phyla, have a high degree of sensitivity to various physical agencies – each to its own appropriate kind

Specialization in sensory cells begins at an early period in phylogenetic history Authorities have suggested that in their most primitive forms sensations are pretty much all of a kind, the organisms not possessing the requisite mechanisms for differentiating sharply between kinds of physical agents attacking the body In some of the classes of coelenterates are found special epithelial cells that are capable of reacting selectively to tactile and chemical stimuli, and pigmented pits that are sensitive to light Position receptors, having to do with position and movement, known as *statocysts*, appear in this phylum also, and are present in all phyla above this level Added to this mechanism are the semicircular canals at the vertebrate level Among the echinoderms, for example starfish, is found a more highly developed organization of the visual mechanism, including lens structures

The arthropods (crabs, insects, etc) possess all the foregoing sensory abilities in more highly developed form Their compound eyes are especially adapted to detecting movement Scales, antennae, and tiny hairs are so connected with receptor cells as to make them highly sensitive to tactile stimuli, including sound waves Chemical senses, especially on the antennae, serve as distance receptors for the finding of food Color vision is also present in some of these classes

Fishes and birds likewise possess color vision, but most mammals, all but primates, are thought to be color-blind The chemical senses, smell and taste, are highly developed in fishes Taste buds are distributed over the surface of the body of many species, and especially over the barbels, both taste and smell thus acting as distance receptors

Hearing, true hearing, definitely is present among the birds, although there is evidence of this ability among some of the reptiles All the senses make their appearance below the level of mammals

We may now consider more fully the functions of sense organs in mental life The distance senses supply data concerning things beyond the organism's body In mammals these are seeing, hearing, and smelling, chiefly Birds, being largely anosmic, rely upon seeing and hearing Fishes, lacking auditory mechanisms, utilize taste, smell, vision, and touch, as distance senses

Our awareness of the world external to our bodies is dependent upon our distance receptors Once objects are brought into contact with the body we may, through the medium of taste and by examining them tactually or kinaesthetically, gain further sensory knowledge of their properties But in all cases it is true that the range and kinds of experience we have of objects is strictly limited by the range and kinds of sense organs we possess

We have other senses that supply data about the condition of our bodies Some of these, pain and the temperature senses, have great protective value Others, hunger and thirst, are instrumental in maintaining the food and water balance of the body These senses — pain, the temperature senses, and hunger and thirst — are primary forms of motivation

Herrick has suggested that inasmuch as the organism is usually "protected by more or less impervious coverings, cuticle or shell, the sense organs may be thought of as windows, each of which can be penetrated by its own kind of physical energy — light waves, sound waves, pressures, various chemical substances, etc" [8] Without sense organs there could be no knowledge, no behavior, no learning, and no mental development A person deaf from birth has no knowledge of the world of sound. All our knowledge has a sensory basis, although general knowledge, conceptual and inferential knowledge, are only indirectly dependent upon the senses But such knowledge has a sensory basis, and without sense organs could never arise

[8] *Op cit*, p '20

Of all the divisions of subject matter in psychology the best developed is sensation We cannot in this volume undertake to discuss any of the facts of sensation The writer has given an account of some of them in his *Introduction to General Psychology* [4] The most complete and perhaps the best account presented in any textbook in general psychology is to be found in Boring, Langfeld, and Weld's *Psychology* [5]

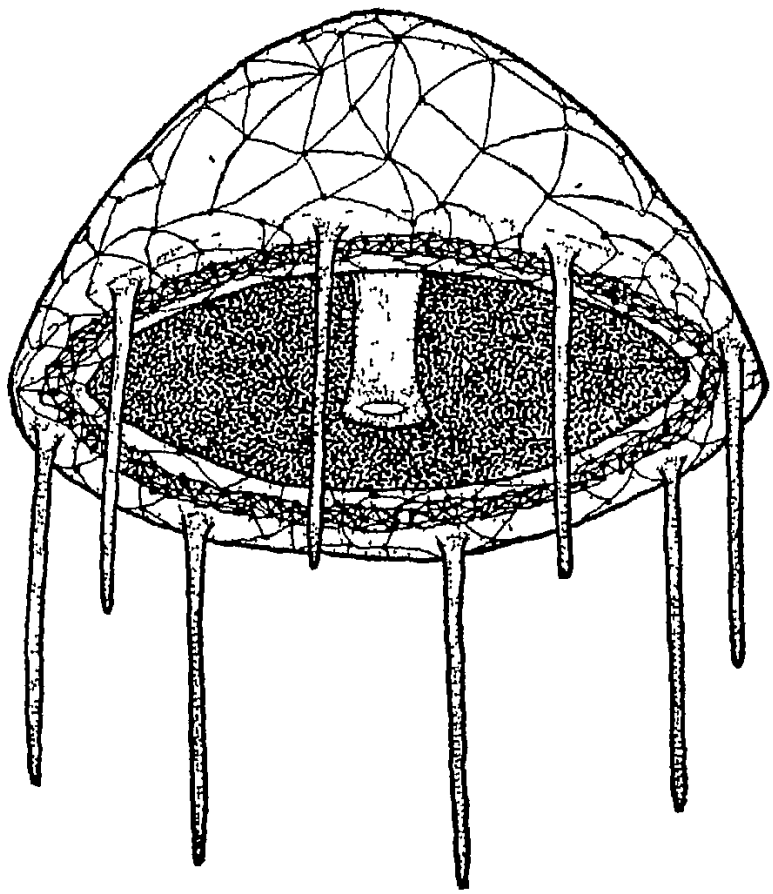


FIG 1 A MEDUSA — NERVE RING AND NERVE NET

Nerve cells Nerve cells, as well as sensory cells, make their appearance in the phylum *Coelenterata* In their most elementary form they exist as connecting cells interposed between sensory and motor cells In the receptor-effector relationship found in the sea-anemone, the organism, when stimulated, can

[4] J B Stroud, *Introduction to General Psychology* New York Prentice-Hall, Inc , 1938

[5] E G Boring, H S Langfeld, and H P Weld, *Psychology* New York John Wiley and Sons, Inc , 1935

react only in the regions stimulated, since the sensory cells are connected directly with motor cells With the intervention of nerve cells, the sensory cell excites the nerve cell which in turn excites a muscle cell at its distant end This arrangement makes action possible in regions of the body other than those in the immediate vicinity of the points of sensory stimulation — an arrangement that greatly increases the efficiency of the organism

(1) *The nerve net* In the higher orders of coelenterates we find nerve cells organized into a system known as the nerve net, as shown in the accompanying figure [6] This is literally a network of nerves Impulses set up by stimulation at any point spread over the entire network This type of nervous system makes for *mass action* While it is an advancement over the arrangement first encountered, it is very inefficient in comparison with the synaptic system found in higher phyla

(2) *The central nervous system* The central nervous system is a synaptic system Nerve cells are not joined in a continuous network but exist as semiautonomous units The connecting arrangement of cell with cell is known as a synapse The synapse permits *selective action* One distant part of the body can act while others remain quiescent, or different members of the body may do different things at the same time

This type of system makes an appearance in the worms At this stage of development it consists of two parallel trunks running throughout the length of the body The two trunks are connected with cross fibers (connecting neurones) at each segment, and nerve fibers connect the sensory cells, by means of sensory neurones, with the trunks, and motor neurones connect the trunks with the muscle cells

In the segmented worm cross fibers unite with the trunks to form ganglia, each such ganglion acting as a sort of center, each center being largely autonomous Head dominance, as found in some measure in the arthropods, and which is the striking feature of vertebrate evolution, is for the most part absent in

[6] Reproduced from the author's *Introduction to General Psychology*, by permission of the publishers

the worm In the arthropods the two parallel trunks are reduced to one, and the number of ganglia is reduced

The course of evolution of the nervous system, as observed in comparing worms and insects, continues throughout the vertebrate orders The head end becomes increasingly important, although the changes occurring from the fishes to the birds are not great The brain of the latter is not a great deal better than that of the former Mammalian evolution in particular is featured by increasing brain development, notably cerebral, and consequent cerebral dominance

Neurologically, mammalian evolution is the evolution of the cerebrum or *new brain* The cerebrum of a fish is rather insignificant That of the amphibian and reptile is not much better developed, and indeed the bird, while having a bigger cerebrum, scarcely appears to have a better one Thus highly developed cerebra are a mammalian acquisition On the other hand the brain stem, or *old brain,* changes comparatively little throughout vertebrate evolution, save for the fact that it is subject to increasing cerebral dominance

The central nervous system becomes the integrating or correlating mechanism for various modes of behavior The spinal cord becomes a center for spinal reflexes, the brain stem, a center for head reflexes, the vital reflexes, and instincts and emotion Most of the tissue of the old brain is thus assigned to the performance of various innate or preformed patterns of behavior On the other hand, the tissue of the new brain is very largely unassigned The use to which this brain is put is not determined to any large extent by biological heritage, beyond the fact that nature probably sets certain limits upon its use in the case of each species and each individual We shall have occasion to see something of the significance of this fact presently

There is, in addition to the central nervous system and its spinal and cranial nerves, another nervous system known as the *autonomic* While it is related to the central system, it is in a certain measure autonomous In general this system controls the vital organs, glands, and the digestive and reproductive processes

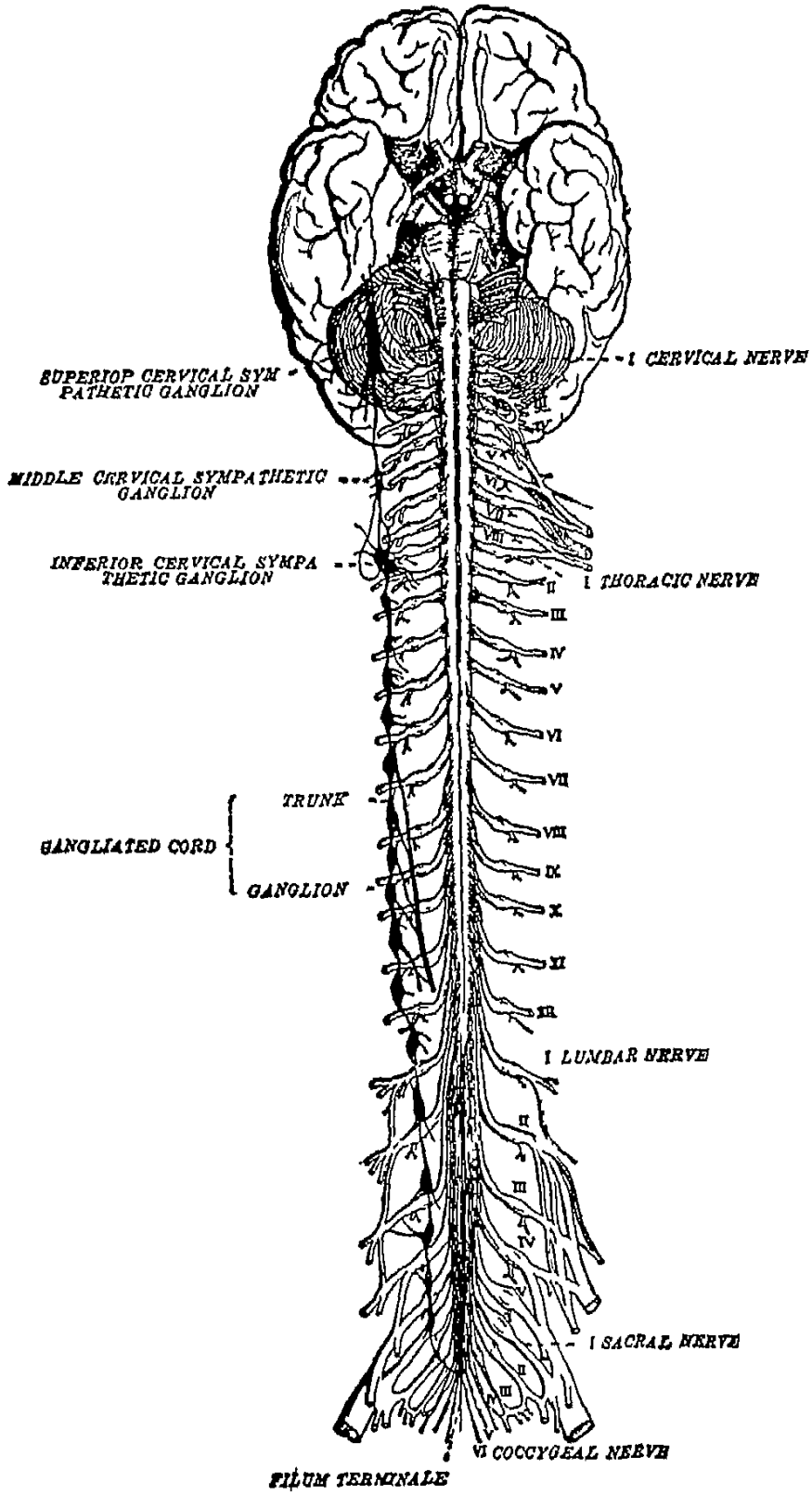


FIG 2 THE HUMAN NERVOUS SYSTEM FROM THE VENTRAL SIDE
(From Herrick, after Thompson and Rauber)

Figure 2 depicts the general outline of the human nervous system Attention is called especially to the large mass of the cerebrum and to the autonomic system which runs parallel to the spinal cord

THE INSTINCT HYPOTHESIS

Instinct as a topic in psychology has lost favor within the last 15 or 20 years One reason for this is its lack of explanatory value The finding that a given act is instinctive does not explain the act, but it does contribute to the explanation of the animal in question If it should be determined that man has instincts *x*, *y*, and *w*, and that each makes its appearance at a certain period of his development, a real contribution to the understanding of man would be made Or, if the present view that man's behavior is of a cultural origin, at least that which is distinctively human, should ultimately be firmly established, a contribution of the first magnitude would have been made toward the understanding of man Moreover, knowledge of instincts and of their operation among animal phyla makes an important contribution to the understanding of the nature of mental life in general

Definition and history The term *instinct* apparently came into psychology by way of philosophy and biology It was given its present formulation by Charles Darwin about the middle of the last century While the term has been used widely both in popular and scientific writings and has acquired, therefore, several meanings, it is generally used today in scientific writing to designate the more complex innate patterns of behavior The term *reflex* is reserved for the simpler innate patterns Some well-known examples of the latter are sucking, swallowing, respiration, dilation and contraction of the irises, and glandular secretions The term *instinct* is reserved for the more complex patterns, such as nest building, migration, mating, rearing of young, and food getting The term *behavior pattern* is employed for the purpose of distinguishing instincts from other types of inheritance, such as color of the eyes, anatomical characteristics, and the various innate urges or propensities

Up until the beginning of the 19th century scholars had apparently taken little interest in the question of human instinct In fact the dictum that animals are guided by instinct, man by reason, had stood as one of the classical distinctions between animal and man Darwinian evolution, which assigned to man an advanced position among the animals, did much to draw attention to the kinship between man and animal Indeed some interpreted evolution to mean unbroken continuity of development — a belief that found expression in a search for the "missing link" As a consequence of these teachings, men came to look upon the presence of human instincts as a distinct possibility

The eloquent writing of William James, toward the close of the last century, had much to do with the popular acceptance of a belief in human instincts He insisted that man, far from having no instincts at all, surpasses the lower animals in the range and function of instinctive equipment [7]

The tendency to attribute instincts to man and to employ them in explaining human behavior was not seriously questioned until about 1920 An examination of the textbooks in general psychology written prior to that date will show the extent to which instinct was regarded as a factor in human behavior Tentative listings of human instincts were featured prominently in some of the earlier textbooks in educational psychology, and rightly so because the issue was of first rate importance in education

During the last two decades the instinct concept has lost favor among human psychologists, while the importance of instincts in animal life is generally recognized It is rather difficult to determine what all the factors are that have been responsible for the shift in opinion with respect to the question of human instincts Doubtless one important contributing factor was the work of the child psychologists About 1920, psychologists began to employ the genetic method of studying child behavior — a method that had proved to be serviceable in studying animal behavior While it must be said that this

[7] W James, *The Principles of Psychology*, Vol 2 New York Henry Holt and Co , 1890

method was not employed upon a scale sufficiently extensive to disprove the existence of human instincts, yet the scope of the work was ample to demonstrate that instincts are not the most obvious facts of child development One of the outcomes of these early investigations was a critical revaluation of the sources of human behavior

It is significant also that at about this same time the cultural hypothesis of human nature was prospering at the hands of the sociologists and the cultural anthropologists (*cf* Chapter III) This concept, serving as it does as an engaging hypothesis of the development of human nature, tended to eliminate the necessity of an instinct hypothesis. Of course, so long as the belief was entertained that man was created outright on a certain day 4006 B C no problem of explaining human nature presented itself But with the acceptance of the doctrine of evolution such an explanation became a matter of urgent business

Instinctive ability and learning ability Two important principles are discernible in the evolution of animal phyla group adaptability and individual adaptability Inasmuch as instinctive modes of behavior are found in practically all of the members of a given species, they may be looked upon as instances of group adaptation to environmental needs On the other hand, those patterns of behavior that are acquired as acts of learning within the lifetime of the individual are instances of individual adaptation Naturally, those species that change least during their life history are dependent most upon their original nature and are least capable of learning, while those that have the greatest learning ability are least dependent upon original nature Lloyd Morgan about fifty years ago called attention to this inverse relation between the instinctive equipment of the species and their learning ability [8]

Field studies show that the most perfect examples of instinctive behavior are found in the lower forms of animal life, such as the insects, the fishes, and the birds It is also known that the requisite nervous mechanisms for learning are poorly developed in these species Those animals which possess the more

[8] L Morgan, *An Introduction to Comparative Psychology* London The Walter Scott Publishing Co , Ltd , 1903 Second Edition, Revised

highly developed brains, and which consequently are capable of the greater learning, display less precision and nicety in their instinctive patterns

While the brain stem remains remarkably stable as to its general function throughout the vertebrate orders, it is subject to increasing dominance as the hemispheres grow in size and function We thus have at hand a neurological explanation of the fact that those species that are most capable of making individual adaptations are least dependent upon preformed patterns By the same reasoning we should expect man, who occupies the advanced position in cerebral development and consequent capacity for individual adaptation, to be relatively free of biologically determined ways of acting Man's evolution has not been in the direction of instinct, but in the direction of increasing capacity for learning — individual adaptability

Instinct and animal behavior As a single illustration, we shall describe some aspects of the instinctive behavior of migratory fowl It is a well-known fact that many species of birds migrate from north to south and back again over distances that may amount to several thousand miles The Arctic tern, one of the most celebrated migrants, covers in a round trip approximately 22,000 miles

Aside from the general question of how migration came to be established in the various species, two problems are of particular concern the conditions that set birds off on their migratory flight and those that determine the route taken As solutions of the first, shortage of food in the breeding grounds of the north owing to the approach of winter, falling temperature, changes in barometric pressure, and the like have been proposed One fact alone makes untenable all of these proposals, to wit the constancy of the date of departure year by year for a given species

A premature cold wave or an abortive snow storm does not initiate the flight There is likewise nothing constant in the availability of food As a matter of fact, most species leave the north far in advance of winter, a fact which also eliminates shortage of food as a causal factor Moreover, barometric pressure is in no wise seasonal in character The only known rele-

vant factor which seems sufficiently constant to account for the regularity in time of departure for the different species, year in and out, is the length of the day, or the amount of daylight [9]

In early autumn, Rowan impounded in Alberta a large number of crows, at the time they were starting southward Some of these he kept in an ordinary aviary, the others he kept in an aviary that could be artificially illuminated For the latter group the day was artificially lengthened about five minutes each day, approximating the lengthening of the day that occurs in the springtime The aviaries of both groups were open and unheated The two groups were thus maintained until the ninth of November It was observed at this time that the sex glands of the control group had undergone characteristic atrophy, while those of the experimental group were featured by recrudescence in the manner of the sex glands of birds in the spring of the year Further experimentation suggested that the importance of the lengthened day lay in the fact that it permitted more exercise

These observations tend to link migration with the condition of the sex glands, whose condition is in turn governed indirectly by the length of the day and directly by the amount of exercise the birds get When released, in midwinter, the birds that were impounded in an ordinary aviary were reluctant to leave On the other hand, those given the artificial treatment departed immediately Several were known to have gone northward, none, in a southerly direction

The experiment just described represents an able attack upon an extremely complex problem Naturally any single experiment, however well conceived and executed, must leave a great many problems unanswered However, this work should contribute toward dispelling some of the mysticism that has surrounded the migration of birds

It has been proposed that migrants learn the particular routes followed year after year Although this proposal is not lacking in plausibility, in view of the fact that on an average they live to make five or six round trips, several facts stand against it

[9] W Rowan, *The Riddle of Migration* Boston Williams and Wilkins Co, 1931

Some species typically fly only by night It is not uncommon for the old birds and the birds of the year to leave at different times, following either the same or different routes The cowbirds which do not build nests of their own but lay eggs in the nests of about thirty different species see their young for the first time in their winter home The young migrate neither with their true parents nor with their foster parents

One of the most striking examples is found in the golden plover, which nests on the shores of the Arctic Ocean In the latter part of the summer the old birds foregather on the coast of Nova Scotia and from there set out across the Atlantic and put in on the coast of Brazil From there they proceed to the Argentine Some time after the departure of the old birds the birds of the year come down across the continent and following this land route to Central and South America join their parents in the Argentine Likewise aquatic migrants, of whom there are many, have no opportunity to learn their route

In these examples we see some of the important characteristics of one level of behavior In the nature of the case, learning is ruled out Likewise, purpose or intent or other factors that are subsumed under intelligence are excluded Here is revealed a mode of adaptation to an end — group adaptation — that requires neither teaching nor learning Let us consider this matter for a moment in relief with individual adaptation In the latter inheritance supplies a capacity in the form of cerebral tissue, but the use of this unassigned tissue is left to the experience of the individual members of the species

THE AGE OF MAN

All theorizing about the ascendancy of man starts with some conception of the length of time he has inhabited the earth The Asiatic finds and those of the British Isles suggest that man is very much older than was formerly surmised from the earlier finds on the continent of Europe

The story of early man, in so far as the record has been pieced together, is to be read in the caverns and gravel pits of geologic eras This record consists of a few fossil skulls, jawbones, femurs etc charcoals, and hundreds of shaped tools

of varied use The age of man's venture on earth is reckoned from the reputed ages of the geologic strata in which the fossils and artifacts are found From these evidences authorities have assigned the earliest fossil finds to the early Pleistocene period If this dating is correct, the origin of the genus probably dates back to the preceding period, the Pliocene De Terra, in a recent article on the geologic dating of the various finds in Asia, has assigned the Java Man specimens (*Pithecanthropus* – ape man) to a period about 500,000 years ago, those of the Peking Man (*Sinanthropus*) at between 400,000 and 500,000 years, that is, well toward the beginning of the Pleistocene or glacial period [10]

Antedating by several years the discovery of the fossils and artifacts of either the Java Man or the Peking Man was the discovery of those of the Neanderthal Man, named for the place of the first finds – a valley of that name in the Rhine province The probable age of the finds is placed at 50,000 to 60,000 years These men or quasi-men were at first thought to be the ancestors of modern man, but now are regarded as a distinct species of the same genus Their principal claim to human qualities was their vast cranial capacity, almost of human proportion, and abundant evidence of the use of tools Their craniums, while human in size, were non-human in shape Their thumbs did not oppose the fingers, resembling in this respect the apes Their chinless, massive jaws, their teeth, low foreheads and large supraorbital ridges all argue against continuity with our species

Certain fossils have been discovered in England, the first at Galley Hill on the Thames River in 1888 The fragments suggested a man of modern features – a full-sized human brain, fully erect posture, and none of the facial characteristics of the gorilla or Neanderthal Man Yet these fragments lay in deposits older by several times than any of the deposits containing bones and implements of Neanderthalers The then commonly held conception of evolution, to wit an unbroken line of descent, could not well be reconciled with these facts This

[10] H De Terra, "Geologic Dating of Human Evolution in Asia," *The Scientific Monthly*, August 1940, pp 112–124

man by his features should, according to the prevailing belief, be much closer to man than the Neanderthalers and therefore much younger, yet the geological data indicated much greater antiquity In the period 1908–1912 the various fragments of the Piltdown Man were unearthed and in 1925, the Lloyds skull, brought up from excavations 42 feet below the streets of London Both of these finds were quite fragmentary and inconclusive The Swans-combe skull, reclaimed from a gravel pit ten years later, while not complete, was more satisfactory because the reclaimed pieces fitted together, giving a fairly reliable picture of what the entire skull was like The deposits in which these various remains were found are thought to belong to the middle Pleistocene period, which according to some reckoning makes them about 300,000 years old

The latter quite conceivably may have been our progenitors, and *Pithecanthropus, Sinanthopus, Neanderthalensis* may be now extinct species of hominids, futile experimental attempts in high mental development Thus there is reason to believe that human creatures have roamed the earth at least in some number for what up to the time of the recent discoveries seemed like an unbelievably long time To be sure the evidence is far from conclusive, but a little evidence is a safer guide than any amount of superstition

If one puts any credence whatsoever in these speculations, there arises the question as to why this creature required so long to turn his vast capacities to the building of civilizations Here fossil remains, shaped implements, or glacial deposits do not help us much

It has been suggested that possibly an early acceptance of animistic causation may have had a stifling effect Indeed there is a suggestion that ritual was practiced even by Peking Man Without a written experience of the race, or parent or teacher or other older and wiser person to teach them better, as is the case with our children, animism could well prevail indefinitely One is reminded of James's observation that only that of which we know a little already inspires us to know more and gives point to a suggestion made in the first chapter, namely that the educative process is chiefly one of communication

Prior to the advent of agricultural and pastoral life, the earth could support comparatively few of these creatures and they were probably widely dispersed – a condition that would have been particularly forbidding to the exchange of experience and the transmission of culture Man observes and thinks not merely because there are things to be observed or thought upon, but because he is stimulated by other minds to do so Most men have been civilized by other men and all men are taught by other men Social example and social pressure are requisite to the civilization of a person or of a people We shall see later with what difficulty number systems, systems of writing, and language – the structures of communication and thought – were developed, without which society could hardly have risen even to a level found in the most primitive tribal patterns When we observe the utter complacency of primitive tribes of today, the wonder is not so much that man lived so long so near his former animal existence as that he ever escaped it at all

INNATE PROPENSITIES OF MAN

Plants are rooted down in the soil in such a way that they must absorb food and water when available If the supply in the vicinity of the plant fails, the plant perishes The dawn of animal life required the introduction of a new principle, freedom of action This freedom required some further principle that would urge animal kind to seek out the sustenances of life This office is performed by some of the well-known senses of the body, notably thirst and hunger No animal could know how much water and food his body needs, when it needs them or whether it needs them These senses, sometimes referred to as drives, urges, or propensities, represent nature's methods of maintaining an appropriate water supply and nutritional condition

Likewise, other senses, as the senses of pain and cold and warmth, are indispensable protective devices for animals Propagation of animal species requires initiative – a function served by the reproductive urges

Man possesses the same innate propensities that animals do

and they serve the same function in human life that they do in animal life There is no evidence that man possesses any innate tendencies that are not also common to animals, that are human and not animal Neither is there need of postulating the existence of any innate tendencies peculiar to man There is overwhelming evidence that man acquires most readily tendencies and dispositions to act In fact, acquired tendencies may often supersede innate ones Thousands of people are known to mutilate their bodies and to incur unspeakable torture in order to produce so-called beauty scars Fasting for religious purposes is common to man People have been known to starve in preference to eating tabooed foods, and the human sacrifice is common to various cultures Every generation of modern times has witnessed countless thousands of men submitting to the hardships of the battlefield or freely offering their lives in defense of a *cause*

THE QUESTION OF RACE DIFFERENCES

It is a matter of common knowledge that some races have progressed much farther along the highroad to civilization than others have Inasmuch as a common popular tendency prevails to regard the most advanced races as being biologically superior to the more backward races, it is worth while to examine this issue with some care

The term *race* has non-ethnological as well as ethnological connotations, as is seen in the following "The descendants of a common ancestor, a family, tribe, people, or nation, believed or presumed to belong to the same stock, a lineage, a breed, also, a class or kind of individuals with common characteristics, interests, appearance, habits, or the like, as if derived from a common ancestor" Ethnologically, a race is defined as "a division of mankind possessing constant traits, transmissible by descent, sufficient to characterize it as a distinct human type, a permanent variety of the *genus homo*"[11] The more common bases of ethnological classification are color, texture of hair, and shape of head

Thus by one definition it is legitimate to speak of an Egyp-

[11] Webster's *New International Dictionary*

tian race, a Latin race, an English speaking race, a German race, and so on It is legitimate to do so, so long as meaning is not imputed to this characterization that is implicated only in the ethnological sense of the term The custom of using the term *Aryan* to refer to peoples who speak a language derived from the parent Indo-European stock, and *Semitic* to refer to Arabs and Jews who speak a tongue of Semitic origin is ethnologically indefensible, if ethnological connotations are meant The Germans illustrate the fallacy of dividing races by the non-ethnological definition and drawing conclusions implicated only by the ethnological definition

Racial characteristics For the sake of clarity in thinking it is imperative that a distinction be observed between those characteristics of a race that are truly racial, that is, transmitted biologically, and those characteristics that are not truly racial but are transmitted culturally from generation to generation Also, from the standpoint of our national well-being it is well to keep in mind the fact that culturally acquired characteristics of racial groups may be quite as desirable and quite as undesirable as if they were truly ethnological characteristics The customs of undesirable groups are more to be feared than their blood Incidentally, blood is only a figurative differential, inasmuch as the blood of all races and of all people is essentially alike, except for type

Question of racial origin Two theories regarding racial origins, the polygenetic and monogenetic, are found in anthropological literature The polygenetic theory holds that the various races had different origins This theory has been especially attractive to those who possess the bias that certain races are inferior to others The reader will recall that slavery was countenanced in part on the ground that the Negro was of different and inferior origin, and was therefore unworthy of the humane treatment accorded other races The monogenetic theory teaches that all races sprang from a common origin Therefore this theory does not warrant the assumption that some races are inferior to others because of a more humble or a more recent origin It must be said that both of these theories are highly speculative and that too little is known about the

origin of man to warrant the taking of a positive position with respect to either

Physical characteristics of the races In defense of racial prejudices it is (or was formerly) sometimes asserted that certain races are inferior on the ground that anatomically they resemble animals more than do other races The following are some of the comparisons that have been made together with the results In the matter of thickness of lips, the anthropoid and the three great races stand in the following order anthropoid, Mongolian, Caucasian, and Negro, in hairiness of body they rank anthropoid, Caucasian, Negro, Mongolian, in texture of hair anthropoid, Caucasian, Mongolian, Negro In length of arms the Negro is nearest the anthropoid, in length of legs he is farthest removed The supraorbital ridges, bony ridges just above the eyes, present in the gorilla and chimpanzee and in early human finds, are more prominent in the Caucasian than in the Negro [12] In redness of lips, a specific human characteristic, the Negro is farthest removed from the animal The alveolar processes (gums) of the Negro are pushed forward resembling more than other races the higher apes The same may be said of the broadness and flatness of the nose [13] In the latter respect the rank is anthropoid, Negro, Mongolian, and Caucasian

We come to the conclusion that the procedure fails to give any indication of racial superiority or inferiority The debits and credits are about equally distributed Moreover, the method is inadequate to the problem and is worth mentioning not only because it has some lodgment in popular fancy Should it have turned out that one race resembled the animal more than another on every one of the foregoing traits, there would be no justification, by known facts, for designating that race as being inferior to the others [14]

[12] O Klineberg, *Race Differences*, pp 34–36 New York Harper and Brothers, 1935

[13] F Boas, *The Mind of Primitive Man*, pp 21 ff New York The Macmillan Co , 1911

[14] For a recent discussion of this subject the reader's attention is called to the following W M Krogman, "Is There a Physical Basis for Race Superiority?" *Scientific Monthly*, November, 1940, pp 428–434

The literature contains a great many reports of investigations of the cranial capacities of various racial groups An excellent summary of this work has been made by Klineberg, a part of which is given here in Table I [15]

TABLE I

CRANIAL CAPACITIES OF CERTAIN RACIAL GROUPS

Racial Group	Cranial Capacity in Cc
African	
Bushmen	1324
Negroes	1380
Kaffirs	1460
American Indians	1440
Eskimos	1563
Chinese	1456
European Males	1450
European Females	1300

The sample cases reported in Table I as well as the more than seventy investigations reported by Klineberg fail to show any tendency toward racial superiority in cranial capacities

Such qualitative studies of brain tissue as are available likewise fail to show any significant racial differences Since it is not known exactly in what respect the brain of an intelligent person differs from the brain of an unintelligent person, any consideration of qualitative differences in brain tissue of different races must be somewhat beside the point Did we know the chief differences between the brain tissue of feeble-minded and dull individuals on the one hand and intellectual geniuses on the other, and other gradations in between, this information would be of inestimable value in appraising the intellectual abilities of different races This information we do not have

Alternative explanations The study of racial differences begins with the obvious fact of differences in racial achievement One possible explanation of these differences is based

[15] O Klineberg, *op cit*, pp 83–89

upon theoretical differences in innate intellectual capacity to devise civilized ways of living It must be admitted that definite confirmation of this explanation is not at hand We shall now examine some of the other proposed explanations

As seen above, there is some reason to believe that man and related species have inhabited the earth for probably a half-million years Authorities are of the opinion that the most advanced stage of paleolithic culture, known as the Magdalenian period, is not less than twenty thousand years old [16] Boas has suggested there is no reason to suppose that all races entered upon the road to civilization at the same time, or that the whole of mankind the world over should reach a given stage of civilization in a given time A difference of three or four thousand years in beginning or in reaching a certain stage of civilization has no great significance In this light it is of little consequence in so far as the question of racial abilities is concerned if one race be a thousand or even five thousand years ahead of another Such differences, as Boas suggests, could well be explained in terms of the vicissitudes of racial history, without assuming any differences in aptitude for social development

It has seemed significant that nearly all members of the white race have attained a more or less advanced level of civilization, while a like condition prevails with respect to no other race Must we assume that all the tribes and groups of white people would, without help, have reached the level they now occupy? Would many of them not still be relatively uncivilized except for the fact that they have been civilized by their fellows? We have abundant evidence of a vast influence of cultural importation upon groups of people

Moreover, again following Boas, the white tribes of Europe readily assimilated the culture to which they were introduced, while other primitives have done so only to a moderate degree, or have actually been degraded rather than elevated This is quite understandable In appearance the ancient men of Europe were similar to the civilized men of their times Hence those erstwhile primitive white men who rose to the level of higher civilization were not still looked upon as belonging to a

[16] F Boas, *op cit*, p 9

primitive race, but were accepted as equals Thus the cultural-ization of the tribes of Western Europe was not hindered by racial barriers

It is also pointed out that the contrast between the culture of the modern whites and the present-day primitives is greater and more fundamental by far than that between the civilized ancients and the primitive ancients Thus the conditions for the spread of culture between various tribes of white people have been much more favorable than those between the whites and primitive peoples of other races

In support of the foregoing position may be cited the spread of culture between the Arab and the Negro Between the eighth and the eleventh centuries, A D , Hamitic tribes were invading the Sudan The invaders intermarried with the natives — the process being facilitated partly by the practice of polygamy "The mixed races, some of which are almost purely Negro, have risen high above other African Negroes" [17]

Thus the Mohammedans have been able to civilize the Negroes of the Sudan, raising them almost to their own standards, yet the white man of Europe has asserted relatively little influence It is suggested that this difference in result is accounted for by a difference in the method of introduction

SUMMARY

On the side of man's original nature the following may be set down unequivocally as contributing to his ascendancy in the animal kingdom his vast cerebral development and consequent capacity for learning, his deft hands and upright posture which freed his hands from the duties of locomotion, and his well developed oral organs — a development that has made possible their ready education for purposes of oral language

An educational lesson of the first rank to be drawn from this discussion of man is that his skill, his knowledge, his customs, and all else that he has fabricated are not perpetuated through biological inheritance, but only through social inheritance Today our youth have learned vastly more by the time they attain adulthood than all the races of men learned from earliest paleo-

[17] *Ibid*, p 14

lithic times down to the modern era This learning which is open to the youth today and which was not open to the Cro-Magnon Man is owing to one thing, cultural transmission Presumably a Cro-Magnon culture would produce Cro-Magnon men of our youth today instead of the "twice-born" specimens of modern society A Sioux or Bantu culture certainly produces Sioux and Bantu men There may well have been some selection on the side of capacity from Cro-Magnon days to the present, but without the cultural creations that have intervened and have been handed down to succeeding generations our youth should stand to rise no higher than those of that distant period

In the light of our knowledge of biology we may assume that the achieving of civilization has not altered original nature, at least not to such an extent nor in such a direction that man today could without tuition behave in a civilized manner That which makes modern man a civilized person is the educative influence of the tools, arts and knowledge of civilization, not something which the achieving of civilization has done to his original nature.

CHAPTER III

MENTAL DEVELOPMENT AND THE CULTURAL HERITAGE

Man learns very little that is novel, few inventions or discoveries are made *de novo* Practically all of them make use of established knowledge The development of alphabetic writing was the work of many centuries and the final "discovery" was made by comparatively few people For nearly all of the peoples who have used it as a basic system of writing it has been an importation As much may be said of number systems Man, without the cultural heritages of the races to guide him, would be capable of only the most elementary discoveries and unless these small beginnings were passed on for the stimulation and guidance of succeeding generations, civilization in any degree would be impossible of achievement Man is indeed in a very literal sense a product of his culture By this means he has lifted himself from an animal to a human plane Cultural transmission is the *sine qua non* of human development, whether racially or individually considered We have borrowed from the past Indeed we *are* borrowed from the past We are the epitome of racial experience Primitive tribes were able by informal teaching to provide very well for the culturing of the youth, but as the cultural heritage has grown in richness and scope, the burden has become much too great for the family and the elders to assume Hence, our schools

CULTURE AND THOUGHT

Not only would individuals, each in his own lifetime, be literally incapable of developing systems of writing, number, and of spoken language, but such individual developments would be virtually worthless were they capable of achievement A system to be of any value from the standpoint of communication must be used in common by large groups of people Moreover, one's willingness to master these cultural products thus

provided by social heritage is owing to social pressure And even this is only the beginning of man's debt to his culture for "in adopting the forms of expression used by those about us, we are led to take up certain social forms of thought which ultimately control the whole mental life"

If, for example, there is no word in a certain social environment for long spatial distances except a word which refers to a certain number of days' journey, it is not likely that the individual will feel any tendency to discriminate fifteen miles from seventeen His attitude in this matter will be determined by the attitude of his social environment, and he will neglect in his thought, as do those about him, the finer details of distance Similarly, if there are no names for certain forms of property rights, it is not likely that the individual will, of his own initiative, recognize these forms of right as belonging to those who constitute the social group with him The history of thought has been, in large measure, the history of the development of certain social ideas which could be marked with definite names and made subjects of thought, because they were so marked Consider for a moment the difficulty which would be experienced in conducting any train of thought with regard to the forces of physical nature if there were no names for the different forces and no fully developed definitions to give each name clearly recognized character If it is true that general tendencies of thought have been dependent upon the development of words to express ideas, it is still more true in the case of the individual that his mental tendencies are very largely determined by the forms of social thought expressed in words [1]

Piaget makes the point that logic develops as the child's thoughts become socialized The young child's thoughts are egocentric, he assumes that others necessarily think as he does, says Piaget This apparently comes about in part from the fact that the young child does not readily distinguish between words and ideas, on the one hand, and the things they symbolize, on the other Through social interaction he learns that different opinions about things are possible, and that opinions may be wrong From the same source he learns that it is possible to make empirical tests of opinions [2]

[1] C H Judd, *Psychology General Introduction*, pp 225–226 Boston Ginn and Co, 1917 Reproduced by courtesy of the publishers

[2] J Piaget, *Language and Thought of the Child* London Paul, 1926

Thus there is reason to believe that man owes so intimate and personal an aspect of his nature as his own thought processes to his culture, not only the content but even the form of his thoughts In a train of thought – which is mediated by addressing symbols to one's self – it is just as essential that the thinker get the meanings of the words and symbols as it is that an auditor get them in social conversation As Mead points out, there are certain symbols or gestures that affect the individual as they affect other individuals, that arouse the same response in the individual as they do in others "Here, then, we have a situation in which the individual may at least arouse responses in himself and reply to these responses, the condition being that they have an effect on the individual which is like that which they have on the other That, for example, is what is implied in language, otherwise language as a significant symbol would disappear, since the individual would not get the meaning of that which he says" [3]

Again, following Mead, a condition of language is that it *signify* and *indicate*, that the word or gesture or other sign be significant to the person who manufactures it and indicate something to another This means that the symbol must have a meaning that is common to both persons, and in practice, a meaning that is common to the group Language in an extremely limited sense could arise between two persons or among the members of a very limited group, like a family, and could function in a similarly limited manner in thought But by virtue of cultural transmission an individual starts his intellectual life with standard symbols by the thousands at his disposal The meaning of these his more mature fellows already know Social example and social pressure so hasten their acquisition by the child that ere he attains his second birthday he has learned the meaning of a sufficient number of these standard symbols to afford a basis of thought

The social genesis of thought It is especially noteworthy that the individual converses with himself with the aid of exactly the same symbols as those with which he converses with

[3] G H Mead, *Mind, Self, and Society*, p 145 Chicago University of Chicago Press, 1934 Reproduced by courtesy of the publishers

others, and that he converses with others first From this we may infer that the genesis of thought is social communication "Thinking always implies a symbol which will call out the same response in another that it calls out in the thinker Such a symbol is a universal form of discourse, it is universal in its character We always assume that the symbol we use is one which will call out in the other person the same response, provided it is a part of his mechanism of conduct A person who is saying something is saying to himself what he says to others, otherwise he does not know what he is talking about" [4] Words produce the same responses in the thinker that they do in others But it is significant psychologically that they *produced these responses in others first* They come to produce these responses — have these meanings — in the thinker by virtue of their effect upon the group

The social genesis of inalienable rights Thus the technique and form of thought have a cultural origin Moreover, from the same source we get our superstitions, customs, beliefs, aspirations, attitudes, and religion, both the fact and form of religion, and likewise our rights and liberties A first culture man has a right to his wife, as is signified by the cord he ties about her loins — a kind of magical binding He has this right, both as consciously appreciated and as an objective fact, because others recognize it Moreover, he has the right to slay any other man who attempts to practice seduction He has this right also because it is recognized by others Polynesian parents have the right to practice infanticide, for the same reason A person is incensed by the abrogation of those rights and liberties which his culture has taught him he possesses His inalienable rights of which he talks with so much self-assurance turn out to be nothing more than those rights which have names and which other people have recognized And the liberties for which men are alleged to have fought from the beginning of recorded history change so much from era to era and culture to culture within an era as to suggest that they, too, are based upon social recognition We also find that the causes of war are pretty largely formalized Likewise, modesty with respect to

[4] *Ibid*, p 147 Reproduced by courtesy of the publishers

parts of the body also has a cultural basis, in that it exists only in behalf of those parts of the body that are conventionally covered with clothing and because they are so covered Except for clothing feelings of immodesty could not exist with respect to parts of the body

The social genesis of abstract thought "Language is a *catalogue raisonné* of the notions of all mankind" — Mill Mueller makes the point that if within a language there is no name for father-in-law, the people who speak that language do not know what father-in-law is [5] The character of the language of a people or of a tribe reveals the character of their thinking, and indeed shows us what the level of their mental development at a given time is If the members of a tribe do not have an expression for *the eye*, as opposed to *this eye* or *his eye*, or if they cannot form the expression *love* or *pity*, as opposed to *his love* or *his pity for him* — to use examples employed by Boas — and if a like absence of terms denoting abstraction with respect to other general concepts is found, we may safely surmise there is everywhere present among those people the most rigid limitation in abstract thinking For them then existing culture, limitation in language is causal to limitation in thinking Without the necessary expressions abstract thinking cannot go on

But, in another sense, it may be equally true that were there any great desire for abstract thinking the necessary forms of expression would emerge Did the pattern of culture create the demand for abstract thinking, the people probably would find means of forming the concepts Says Boas, the Indian will not speak of goodness or of the power of seeing, in the abstract, apart from the goodness of a person or without designating an individual who has the power of seeing [6] One reason for his not doing so is the fact that his culture, including his language, does not make this demand upon him The interrelationship between general culture, language, and thought can scarcely be overemphasized They are mutually supporting one to the

[5] F M Mueller, *The Science of Thought* (Three introductory lectures), p 48 Chicago The Open Court Publishing Co, 1877

[6] F Boas, *The Mind of Primitive Man*, p 150 New York The Macmillan Co, 1911

other Each influences, and is influenced by, the other "Language is generated by intellect and generates intellect." – Abelard [7]

CULTURAL SOURCES OF HUMAN NATURE

We are human because we can talk, civilized when we can write, and scientific when we have a sound method of isolating problems, seeking facts, inventing explanations, and testing these objectively – Faris

Man since the earliest paleolithic times has lived by his culture, and his nature in turn has been shaped by the character of the culture he has wrought It is the thesis of this chapter that the fact of becoming human is conditioned in large measure upon being reared in a human environment, and that the kind of human being one becomes is contingent upon the kind of human environment in which he is reared, with due allowances made for individual differences in potentiality Man develops cultural products – language, tools, religion, and varied institutions – to meet his needs These are adaptations to ends just as projection, rationalization, and fantasy are adaptations to personal problems, and like the latter these adaptations when made contribute to the making of the man

The concept of culture To those who have forgotten their freshman sociology let it be said that the term *culture* is used by anthropologists and other students of social behavior to designate various sorts of creations of man that are handed down from generation to generation These creations consist of all the channeled ways of social interaction, ways of meeting strangers, addressing servants, procuring a wife, going to war, acquiring property, entertaining guests, maintaining a family, or of behaving at religious functions They also consist of tools or implements of varied use and application We study the history of man, reckon the time at which his civilization began, and gauge his level of attainment from era to era in terms of his tools

Culture consists in all of the customs, attitudes, knowledge, language, and implements of people that are handed down and

[7] From Mueller, *op cit*

taught the young Even among the most primitive tribes the young are taught the way of life of the group In a fast-moving social order, such as our own innovations are comparatively frequent The culture of primitive peoples is much more stable, individual members may exercise much less freedom in making adaptations to environment

> It is difficult to exhaust the customs and small ceremonial usages of savage people Custom regulates the whole of man's action — his bathing, washing, cutting his hair, eating, drinking, and fasting From his cradle to his grave he is a slave of ancient usage [8]

Malinowski tells us, however, that there are certain spheres in primitive life where individual adaptation is permitted and even rewarded [9] It is in the long list of ceremonial usages that little deviation is tolerated

The behavior patterns of a people reflect the cumulative experiences of those who have lived before them Unquestionably the origin of the great majority of the cultural patterns of every type of civilization is lost in antiquity [10] Faris poses the question Who can explain why in one cultural pattern a man owes his first allegiance to his wife rather than to his parents, while in another his parents take precedence over the wife? [11]

Group priority Social psychologies written a generation or so ago prevailingly took as their point of departure man's original nature his instincts and inborn tendencies, and proceeded to an explanation of his customs, traditions, institutions, and the whole of his civilization in terms of this original nature The nature of the social order with its good points and its bad points was said to be what it is because man's original nature is what it is Many social ills were partially excused on the ground that man has in his original nature a certain amount of the perverse A few years later the opposite point of view began to take

[8] From W G Sumner, *Folkways*, p 28 Boston Ginn and Co , 1906 Reproduced by courtesy of the publishers

[9] B Malinowski, *Crime and Custom in Savage Society* New York Harcourt, Brace and Co , 1926

[10] S Winston, *Culture and Human Behavior*, Chapter IV New York The Ronald Press Co , 1933

[11] E Faris, *The Nature of Human Nature*, Chapter XIX New York McGraw-Hill Book Co , 1937

hold Whereas the original view had held human nature to be prior to the nature of the social order, the revised view holds that the nature of the social order is prior to the nature of human nature As Professor Dewey has so aptly said, our institutions cause our "instincts," not instincts our institutions

Each individual, by the time he reaches adulthood, is able to acquire the fundamental elements of the intellectual, moral, religious, social, economic, and mechanical culture of his race, elements that have been centuries in the making *In the acquisition of these cultural elements, human nature takes form* If the cultural elements to which the individual is subjected from birth to maturity consist of magic, superstition, tribal custom, taboos, totem poles, and wooden spears, the result is a savage.

The facts gathered from the study of man in all forms of society, from the most primitive to the most modern, argue that individual nature is determined by the prior nature of the group into which he is born Without the group transmission of cultural patterns the infant of today would have to begin in a cruder way by far than any of the primitive men of whom we have any record, even Java Man "Without the priority that is represented in group transmission of civilization, the modern infant would be helpless before animal life of all forms, even those on insect levels He, or even the most mature of us, would not have a chance of surviving long before the engulfing primitive conditions that would be operating" [12]

Anthropologists have repeatedly called attention to the vast differences in the character of people of different cultural groups, even though the groups are racially and linguistically similar As Benedict has said, cultural patterns are local and do not correlate with racial characteristics Human nature seems to follow cultural patterns rather than racial ones Moreover, the character and temperament of a group may change without the slightest evidence of corresponding changes in their biological constitution [13] The work of the anthropologist in

[12] E S Bogardus, "The Principle of Group Priority," *Journal of Applied Sociology,* 1922, Vol 7, pp 84 ff

[13] R Benedict, *Patterns of Culture,* pp 233–234 Boston Houghton Mifflin Co , 1934

delving into ancient ruins, in plying his trade in the remotest places of the world, and in learning the languages and customs of primitive people of today, has resulted in much more than lectures and lantern slides for public platforms, and thigh bones, totem poles, and loin girdles for museums It has forced the realization that except for the culture that has intervened between us and the savage, we should be savage, and except for the culture that intervenes between savage and animal, he would be animal, and a very poor one at that

The fact that slavery, witchcraft, dueling, polygamy, "healing," magic, infanticide, bride purchasing, scalp hunting, the seeing of visions, and the possessing of evil spirits have all been in the mores of peoples, ancient and modern, is common knowledge If vision-seeing is in the mores, as for example among the Indians of the Great Plains, and is an accepted practice, vision-seeing is common This phenomenon is rare among those tribes in which it is not condoned and expected as a natural experience

Primitive man believes in magic and attempts to ward off impending doom by ritual because they are in the mores As Sumner points out, the notion of right is in custom, not outside of it, or of independent origin "In the folkways whatever is is right This is because they are traditional and therefore contain in themselves the authority of the ancestral ghosts" [14]

Another lesson gained from social psychology is that mores are continually undergoing change Herein lies the explanation of changes in human nature that take place from generation to generation Within the last two or three hundred years in western civilization materialistic mores have gradually supplanted mystical ones One is scarcely aware that change is going on, yet even a superficial examination of the literature of a century or so ago forces the conclusion that such change has taken place

Primitive culture All men today live by culture All men of antiquity of whom we have any record, and even the long since extinct, manlike creatures – the Java, Peking, and Neanderthal men – lived by culture Indeed it is a distinct possi-

[14] Sumner, *op cit*, p 28

bility that man's new brain, being largely unassigned as it is long ago assumed such a position of dominance that his very existence is, and has long since been, dependent upon the maintenance of a culture, and that this condition came about as a concomitant of the evolution of his brain

The term *primitive culture* is certainly a relative one By our standards the culture of the American Indian is primitive, although by comparison with that of many tribes it is highly advanced By primitive culture here is meant first culture of the most primitive to be found, in contrast with the totemic culture of the more highly organized clans and tribes Among our best modern examples of primitive man are the pygmies of Central Africa and the Congo, the Negrito pygmies of the Philippines, the Senoi and Semangs of Malaya, the Veddahs of Ceylon, and the African Bushmen These peoples live in isolated regions of the forests and are thought by authorities to have maintained their isolation for thousands of years, because with but rare exceptions their culture appears to be uninfluenced by that of other tribes Striking similarities have been observed in the patterns of culture of all these widely dispersed primitive peoples The form of their language and family life and the character of their tools present striking uniformity from group to group [15]

The habiliments of these first culture people consist always and for the most part of a bast loin girdle from which is usually suspended some form of covering for the genitals In the adornment of the body a like meagerness is found Decorations by tattooing and painting, practiced so elaborately in totemic culture, are employed sparingly, in the main There are notable exceptions, as, for example, the thrusting of a wooden plug through the bridge of the nose and the practice of the dwarf people of the Philippines of looping blades of grass through holes pierced in their lips Their tools and weapons are principally of wood According to Wundt, the bow and arrow, the latter usually of wood without a stone tip, is practically the sole

[15] W Wundt, *Elements of Folk Psychology*, pp 17–21 London George Allen and Unwin, Ltd , and New York The Macmillan Co , 1916 Translation by E L Schaub

weapon The wooden digging-stick, hardened and shaped by burning, is used extensively as a tool for the digging of roots and bulbs, the staple articles of food

All first culture people today make use of fire, as did *Pithecanthropus* on the alluvial banks of Java a half-million years ago The present-day representatives of first-culture people roast or boil their food, a process that renders edible certain articles that would otherwise be inedible or positively harmful. Incidentally, they possess considerable knowledge of poisons Pottery has not made its appearance among first culture people Bamboo, cocoanut hulls, shells and other natural objects are used as vessels These people do not observe a regular time for their meals, but eat whenever appetite and circumstance dictate They do not have fixed places of abode During inclement weather they inhabit natural caves, or sand pits of their own digging, and sometimes construct temporary shelter of limbs and twigs, all of which are abandoned when the need of them is no longer present

Up until about 80 years ago monogamous union was thought to be the natural marital state of man Monogamous unions were thought to have existed in a continuous line from animal to man Soon thereafter ethnologists discovered, when they began to study the culture of preliterates, that monogamy is by no means a universal form of union Polygyny was found to be practiced in many tribes, polyandry occasionally, as among the Polynesians and Eskimos, and sometimes group marriage, which has been regarded as the coexistence of polygyny and polyandry These findings plus the discovery of "mother right" particularly in the Australian culture – for a time regarded as the paradigm of primitive society – led to the acceptance, erroneously, of the thesis that polygamy was an intervening step between agamy or license and monogamy Particularly cogent appeared the argument for an original state of agamy based on the practice of mother right The argument was based upon a modern analogue, namely the fact that children born out of wedlock take the name of the mother rather than that of the father

Fortunately we are now able to turn to the family life of more

primitive culture than that on which the foregoing suppositions were based Here, we are told, monogamy is practiced as the exclusive form of marriage First culture people are strictly monogamous, not agamous or polygamous Incidentally, it is reasonable to suppose that sex behavior is of much greater importance in the life of the people of advanced culture, owing to the large number of symbols that have come to have sexual connotations, than it is in the life of primitive people Ritual, literature, art, song, adornment of the body, and clothing all tend to enhance the importance of sex in the life of man

A final word may be added about the religion of first culture people Naturally, the answer to a query about the presence or absence of religion among these people will depend upon the definition adopted If the broadest possible definition be accepted – that which admits of any practice of magical rites, belief in animistic or supermundane causation or in daemons as being religion – an affirmative answer is indicated Indeed some authorities believe that Java Man and Peking Man, putatively *genera* now long since extinct, observed rites and, by the catholic definition, practiced religion All first culture people engage in magic Their magic centers chiefly, according to Wundt, about two events, sickness and death, and to some extent about marriage Death is regarded, apparently, as the departure of that which gave life But this something, although having departed from the body, continues its existence, especially in the vicinity of the corpse A departed soul thus becomes a daemon, capable of fostering sickness and causing death These and other forms of sickness daemons are thought to have formed the basis of counter magic, which in the hands of the magicians and medicine men plays so large a part in magical practice

Parental behavior It has been said of Descartes, an able proponent of the existence of innate ideas, that his "innate ideas" were those of the century in which he lived We have seen that man's "instincts" vary with the cultural pattern in which he lives If there are any instances of immutable human behavior, of behavior that is alike in all cultures, we should

expect to find them in man's reactions toward his children Klineberg, who has compiled a good deal of information on the so-called parental instinct, collected from many cultural sources, is led to believe that this trait, so long regarded as fundamental and immutable, also varies with the cultural pattern of the group For example, on the Murray Island in the Torres Straits adoption of children is so widespread that it is difficult to trace genealogies, the children taking the names of their foster parents It is reported that on the Andaman Islands it is a rare occurrence to find children above the age of six or seven living with their own parents Here it is considered a compliment for a married man upon taking leave of his hosts to ask to be allowed to adopt one of their children In ancient China the concept of motherhood was divorced from every tie of blood There was one principal wife, and therefore one principal mother The children of the secondary wives were regarded as sons and daughters of the principal wife She alone bore the title *mother* and received the homage due a mother, the blood mothers being regarded as aunts by all children alike Rivers reports that among the Banks Islanders the child belonged to the man who made the necessary payment to the midwife" [16]

Parents at various times and in various parts of the world have entertained widely varying attitudes toward their children In some societies parents have exercised over them the right of life and death The head of a Roman household destroyed his newly born if he did not wish to rear it As a general rule, primitive peoples appear to treat their children much more kindly and sympathetically than do the highly civilized peoples of today, although there are notable exceptions We find tribes who have practiced selling their children For example, the Botocudos of South America willingly sold their children to the Brazilians In the upper Congo they have been surrendered in the payment of debt In other instances children have been sold as slaves, in others infanticide has been widespread

[16] O Klineberg, *Race Differences*, Chapter XIV New York Harper and Brothers, 1935

Klineberg reports that among the Kuni in South Africa there is scarcely a woman who has not killed one or more of her children, this being the custom of her ancestors

The community and the individual The influence of the community upon the individual is brought out strikingly in comparison between the rural citizen and the urbanite, and between citizens of various urban areas The neighborhood characteristic of the typical rural community stamp it as a primary group The people in the rural community are not so likely to be segregated into racial, cultural, or economic groups as in the city community The members are held together by common ties of friendship, kinship, and community interests Relationships are characteristically personal, rather than impersonal as they are in the city [17]

In the urban community friendships are governed by economic and cultural interests rather than by spatial proximity In the rural community or small town the coercive influence of the folkways and mores is felt, in the city this influence is less effective owing to the lack of neighborhood ties Urban neighborhoods possessing all of the characteristics of a primary group are by no means rare even today, particularly among immigrant populations, although this type of neighborhood is declining in importance The city population is highly mobile, the rural population is, by comparison, quite stable "Where mobility is the greatest, and where in consequence primary controls break down completely, as in the zone of deterioration in the modern city, there develop areas of demoralization, of promiscuity, and vice" [18] The more fluid the population of an urban community, the less closely it conforms to primary group patterns, the weaker the primary group life of a neighborhood, the greater is the freedom from restraint This relationship is seen in the high transition areas of certain slums Here, as Roper points out, extreme individualism and freedom from the folkways and mores of primary group life are found, here thrive

[17] M W Roper, ' The City and the Primary Group," *Doctor's Dissertation* University of Chicago, 1935

[18] R E Park and E W Burgess, *The City,* p 57 Chicago University of Chicago Press, 1925

the hobo, the bohemian, the prostitute, the criminal, and the rooming house type

The foregoing finds corroboration in the results of Shaw's study of delinquency areas in Chicago Dividing the city into nine zones of one mile each, starting from the district nearest the Loop, he found the rate of juvenile delinquency in proportion to the total population of the same age and sex, for the various zones to be as follows Zone 1 (nearest the Loop), 20 9, Zone II, 10 7, Zone III, 11 9, Zone IV, 8 1, Zone V, 5 6, Zone VI, 3 1, Zone VII, 1 7, Zone VIII, 2 1, Zone IX, 2 5 [19]

It is worth noting especially, as Shaw points out, that there are striking differences between the various areas of the city in the rate of truancy, juvenile delinquency, and (adult) crime Secondly, it is of the greatest importance that these differences in rate of truancy, delinquency, and crime have as concomitants differences in community background The high rate zones are characterized by physical deterioration and by high mobility of the population

> From the sociological point of view personality is a product of the cultural and social environment The individual acquires a personality which grows out of his contacts in social groups Human nature unlike animal nature is plastic, it evolves through interaction Man s original nature makes this plasticity possible but it does not determine the patterns of his behavior as it does among animals [20]

Self-appreciation The influence of prevailing cultural patterns upon the outward manifestations of human nature seems reasonably clear It is also probable that man's appreciation of himself is of social origin to a considerable extent It is suggested that his self-appreciation grows out of his ability to cope successfully with the physical forces in his environment and his interaction with his fellows

Man's inventions in the character of implements and techniques for controlling the physical factors in his life must have made a tremendous contribution to his appreciation of his own prowess What of that inventive genius who first fashioned a

[19] C Shaw, *Delinquency Areas* Chicago The University of Chicago Press, 1929

[20] Roper, *op cit*, p 162

stone axe and lashed it to a handle? What a sense of security that crude implement must have given him! To him it meant protection and food Now for the first time he could walk the forest as a man, lord of the beast How the use of fire, or the invention of the fishhook, or of the wheel, must have changed man's appreciation of himself! Or, let us think for a moment how the very fabric of our existence would be changed should we awaken some day to learn that the art of modern medicine had been lost, that all the long-established rights of man had been canceled, or that all tools and knowledge of their use had been effaced

As man has learned more down through the ages, he has taught more and learned more, and so on without end. Each new acquisition – the wheel, the needle, the plow, the sail, the printing press, the steam engine, gunpowder, vaccines, and gods – to say nothing of ethical codes and rules of conduct – has added its bit to the very nature of man

> The self is something which has a development, it is not initially there, at birth, but arises in the process of social experience and activity, that is, develops in the given individual as a result of his relations to that process as a whole and to other individuals within the process [21]

Man's social self (or his social selves) arises out of social situations Since the time of James, psychologists have emphasized the many-sided character of self A man has a business or professional self, a club self, a church self, a parental self, and so on It is noteworthy that his status may be very different in each group What is important for our purpose is the fact that his appreciation of himself is causally dependent upon his estimated status in the various groups of which he is a member Mead maintains that while it is possible to conceive of a solitary self once self-appreciation has arisen, it is impossible to conceive of a self's arising outside of social experience To this end Faris states that consciousness of self "arises within a social situation as a result of the way in which one's actions and gestures are defined by the actions and gestures of others We become human to ourselves when we are met and an-

[21] Mead, *op cit*, p 135

swered, opposed and blamed, praised and encouraged" [22] Thus an individual evaluates himself by the reactions of others toward his behavior, or more particularly, by his evaluation of their reactions Illustrative of which is Tolstoy's philosophizing about Napoleon "He could not disavow his own acts, that were lauded by half the world, and so he was forced to disavow truth and goodness and everything human"

The self and the primary group The primary group is, to follow Cooley, the nursery of human nature [23] By primary groups is meant the family, the playground, the neighborhood, and other groups in which free play exists, and face to face social contacts are made Such groups "are primary in several senses, but chiefly in that they are fundamental in forming the social nature and ideals of the individual"

Perhaps the playground stands as one of our best examples of education in a primary group Because of its early influence and because of its co-operative and competitive character, it has an important socializing effect Here the child's status in the group is determined, his responsibilities and limitations defined The emotions that he awakens in his fellows, the regard in which he is held, the duties that are delegated to him, not only contribute to his social behavior but also influence his consciousness of self [24]

Some of the most effective teaching in the home is of this informal type The teaching that parents do when they are not trying to teach at all is probably much more effective than their most carefully designed pedagogy This kind of learning may be styled *inter-learning*, learning one from another in face to face relationships, wherein there is neither intention to learn nor intention to instruct Much of the learning that goes into personality development is of this kind

The primary group character of the school is not limited to the playground Informal learning takes place wherever groups of pupils and teachers meet upon a free-play, give-and-take

[22] *Op cit*, p 7 Reproduced by courtesy of McGraw-Hill Book Co

[23] C H Cooley, *Social Organization*, Chapter III New York Charles Scribner's Sons, 1909

[24] *Cf* Mead, *op cit*, pp 135–226

plane Even the socialized recitation has some of these features

The sectarian group affords a final illustration of primary group life In his paper "The Sect and Sectarian" Faris likens the sect to a primitive tribe Like the primitive tribe, the sect is characterized by certain patterns of culture peculiar to itself [25] To be brought up as a tribesman is to take on the peculiarities of the tribe To be brought up a Shaker is to acquire certain characteristics not shared by the Dunker or a nonsectarian

Social isolation Man's debt to culture may be seen on the negative side by observing some of the consequences of social isolation The culturizing process is not primarily one of trickling down from above It takes place most readily when there is a sense of free play among individuals It is possible for groups to live in close physical proximity to one another and yet be influenced very little one group by the other, provided they are separated by certain social, economic, racial, or religious barriers It is possible for certain families or groups of families to dwell within the confines of a larger cultural area, as in the case of a cultural island, without being influenced in any significant way by the prevailing cultural patterns of the larger group

Thus various kinds of cultural isolation or exclusion are found Some of the more common forms are as follows (1) *spatial,* typified by geographic barriers such as oceans, mountains, and deserts, (2) *structural,* involving sensory defects or limitations in brain capacity, motor ability, health, and personal appearance, (3) *personal,* including those habits and characteristics which are unacceptable to the group, and (4) *psychic,* including racial barriers as well as political, national, social, and economic ones [26] "Variations in language, folkways, mores, conventions, and ideals separate individuals and peoples from each other as widely as oceans and deserts" [27] Thus

[25] *Op cit*, Chapter V

[26] R E Park and E W Burgess, *Introduction to the Science of Sociology,* pp 229 ff Chicago University of Chicago Press, 1921

[27] *Ibid*

W I Thomas states that "by reason of poverty, geographical isolation (or) caste feeling individuals, communities, and races may be excluded from some of the stimulation and copies that enter into a high grade of mind" [28]

Within a heterogeneous framework such as our own, all kinds and degrees of cultural isolation or exclusion are found There are subgroups, large and small, so isolated either by physical barriers, or by those of race, religion, or the economic caste system that they are affected relatively little by the normal process of cultural change To the extent that groups remain outside the range of social interaction they are relatively unaffected by changes in cultural patterns

There is good warrant for the school's concern about the pupil's extracurricular activities — the teams, clubs, and societies to which he is admitted and the friendships he makes. The pupil who is excluded from the various phases of the social life of the school fails, by the extent of the exclusion, to profit fully from the advantages of school life Theoretically all pupils have an equal chance to learn mathematics, English literature, or wood carving, but their chances of getting a fully rounded education are not equal by any means

A good deal has been said in modern times about the advisability of allowing slow learning pupils to pass along from grade to grade with their fellows One of the arguments put forward by the advocates of the procedure is that these pupils will thus be given opportunity to maintain normal social contacts, inasmuch as they will have as classmates pupils of their own age and size For all the writer knows this may be valid argument, but it is well to point out that a pupil does not automatically profit from group contacts merely because he is a physical member of a group It is thinkable that because of his slowness in learning a pupil may be so effectively isolated by a group that his contacts with the group will profit him but little Thus a guiding principle in the grade allocation of dull pupils should be that of finding the age group by which they

[28] W I Thomas, "Race Psychology Standpoint and Questionnaire, with Particular Reference to the Immigrant and Negro," *American Journal of Sociology*, 1912, Vol 17, pp 725–775

are most readily accepted Acceptance by a group is of greater importance than the age and size of its members Age and size are important chiefly because they condition acceptance

CULTURE CONFLICT

The recorded history of man is a history of culture conflict, conflict centering in caste, class, race, religion, nationality, and so on In a sense the struggle between groups is much like the struggle between individuals Common to both is a striving for superiority The techniques for preserving the authority and prestige of the majority group have the same meaning psychologically as those utilized by individuals in maintaining and enhancing their egos After all, conflict between culture groups reduces to conflict between the individual members of one group and those of another

Culture conflict owes its peculiarity, as opposed to individual struggle for self-preservation, to the fact that the sources of conflict are cultural in origin, handed down and, therefore, traditional The individual gets his attitudes of antipathy toward various peoples from the prior attitudes of antipathy of his group on behalf of such peoples Even with respect to race the best opinion is that there is little or no natural or biological ground for the antipathies that are so prevalent today Indeed, in such matters, race becomes merely a sign, the seat of the trouble is not ethnological as such This is seen, for example, in the fact that feelings of repugnance are not engendered by physical proximity to a member of an "inferior race" His presence in a menial capacity may actually give rise to feelings of pride and expansiveness It is social proximity that shocks the delicate sensibilities of the "superior race"

Racial conflict Formerly, the essence of racial conflict (more especially color conflict) apparently was religious conflict At present it is largely economic and psychological Race is a sign of economic conflict, formerly it was, in the western world, the token of a heathen But Christian people could not harmonize with their Christian principles the enslavement and general exploitation of other peoples Hence they justified

their misdeeds by the rationalization that the prostrated peoples were racially inferior

In racial attitudes, as in other matters, the individual accepts the prevailing social standards as right and natural So completely are the prevailing attitudes toward the Negro, for example, justified and assimilated with other social and moral standards that the caste system may be maintained effectively without there being actual consciousness of race prejudice Many persons who do not permit the use of the front door by Negroes can, and do, honestly assert they feel no antipathy toward the members of that race, with the reservation, "so long as they keep in their place" Psychologically, this reservation is the heart of the problem, because the Negro's "place" is one below white people The Negro's place is one of service to the white man material service, as he bears the white man's burdens, and spiritual service, as he does him obeisance As Gallagher points out, the benevolent paternalism which many white families exercise with respect to Negroes, especially their own tenants and servants, is an expression of race prejudice, and is more effective in maintaining the caste system than is overt antagonism, although it is certainly more humane and stems from better motives [29]

The position of the "inferior races" is particularly onerous owing to the fact that the members are identifiable by the color of their skin and texture of their hair Members of "inferior" nationality and religion can, in many instances, escape detection by changing their names and adopting the culture patterns of the dominant or "superior" groups, and can actually become a member of such groups Even if the Negro succeeds in working his way upward, economically, socially, and academically, and adopts the language and customs of the dominant group, he is still denied status in that group He is still subject to the rules of etiquette that are so effective in maintaining the caste system There still prevails, as Gallagher points out, the axiom that "any white man is better than every Negro" and that any

[29] B G Gallagher, *American Caste and the Negro College* New York Columbia University Press, 1938

person with any amount of "Negro blood" is inferior to every white person

Authorities, notably Toynbee [30] and MacCrone [31] aver that during mediaeval times the man of the western world recognized chiefly two classes of people, Christian and non-Christian or heathen It may be that race prejudice as such came into being partially as a historical accident, namely that the Christians of the western world were white and the non-Christians of the rest of the world were prevailingly of different color These barbarians were fit subjects for slavery and exploitation not because of their color or race but because they were non-Christian, as seen by the fact that it was unlawful, by Christian ethics, to hold in bondage a baptized person The white men of western civilization, in that era, laid claim to superiority on account of religion, not on account of race However, it was inevitable, psychologically, that color would come to be a sign of inferior human status, religious fervor being what it was, when missionaries learned that those non-Christian barbarians did not take well to Christianity Thus Christian came to be associated with white man or simply European, and non-Christian, with color

However, other factors militating against the men who fell outside the pale of Calvin's elect soon came to the fore. Especially important in this respect were the African slave traffic and the clashes between white settlers and natives Owing to the insecurity of frontier life, conflict with the natives constituted an ever-present threat to the white settlers' security and was a potent factor in fomenting race hatred And, to be sure, our own history and literature from colonial times down to the present have served to perpetuate and enhance the concepts of superiority and special rights and privileges of the white man Thus race attitudes have never been primarily racial in an ethnological sense, although they are none the less real therefor As MacCrone, for one, points out, race attitudes are only

[30] A J Toynbee, *A Study of History* London Oxford University Press, 1934

[31] I D MacCrone, *Race Attitudes in South Africa* London Oxford University Press, 1937

a variety in a pattern " all the social attitudes of the group, racial, religious, social, and political, come into play in a mutually supplementary way "

The Jew A similar cultural history stands back of present-day prejudices against the Jews and other minority groups, and, like the so-called racial prejudices, conflict between majority and minority groups, as, for example, between Jew and gentile, stems from a multiplicity of causes But, as among racial groups, economic and religious conflicts loom large Perhaps nowhere is " man's inhumanity to man " more forcibly portrayed than by the majority reaction toward the adherents of the Jewish faith The pogroms, the Ghettos, and the enforced wearing of badges of identification are too well known to make necessary their recounting here Jews were forbidden to own slaves, Christian and pagan alike, or to employ Christian labor of any kind or to engage the services of a Christian midwife

Discrimination against the Jews is all the more irrational because they were never outside western culture as were the barbarians who became the victims of oppression and discrimination They have ever moved westward with the tide of culture They were not interlopers in European civilization Golding asserts that of all the peoples of Europe today the Jew has the longest and most continuous settlement, and was certainly identified with European culture long before several of the present nationalities had made their appearance in Europe From the year 1000 A D , he says, " the greater and more vital part of Jewry was definitely settled in Europe, and henceforth associated preponderantly with European life, European ideas, and European intolerance " [82]

In American social life *race* is a symbol of conflict much beyond the confines of race as envisaged by its ethnological meaning The Jews are rather generally regarded (erroneously) as a distinct race (ethnological group) It is common to find the Italians, the English, the Germans, and so on, designated as races of men, and indeed the authority of the Federal Government stands as a precedent for this practice Such is the " racial

[82] L Golding, *The Jewish Problem* West Drayton, Middlesex, England. Penguin Books, Ltd 1938

myth" in America! That most of our popular notions of race are mythological, matters not in racial prejudice, because, as has been noted, racial antipathies are not based upon ethnological considerations anyway The fact that there are relatively few Nordics in Germany does not in any way lessen the German's aspirations for Nordic supremacy The situation would be the same were there actually no Nordics or none other than Nordics in Germany, did the Nordic myth continue to prevail After all, there are no known peculiar advantages or disadvantages, psychologically speaking, in being a Nordic The Germans' views of race are not essentially different from that of most Americans, only the conflict is more violent

Culture conflict and the school Our schools are faced with the problem of culture conflict in a very vital way Such conflict is present in the social behavior of students, which in itself puts the schools under obligations to do whatever they can in the way of amelioration But the obligation goes much beyond this Our schools are committed to the task of furthering our democratic institutions and the fostering of a good life for all our citizens The fact that much so-called racial conflict is not basically racial does not make the problem any less real There are very potent psychological bases for the conflict The fact that such conflict is a powerful element in our social heritage, plus the fact that the grounds of conflict are everywhere present today, should lead to the conclusion that this problem is an extremely stubborn one

As educators we may be pardoned if we see in education some hope of mitigation In psychology we have learned from various sources that knowledge of the causes of conflict and of other psychological disturbances has very real therapeutic value To this end our schools should give systematic instruction in the history and present-day sources of social conflict The mythological aspects of race should be dispelled by the best enlightenment that anthropology can give Such instruction should be given both in the elementary school and in the high school Moreover, such knowledge, especially were it dramatized and emotionalized to an extent, would serve not only to eliminate some of the harshness of the behavior of the

majority groups toward the minority groups, but also to make the lot of the latter more endurable, as they were led to understand the causes of the majority attitudes There seems to be a good chance that systematic instruction in the grounds of social conflict would have the effect of making the conflict less violent While the severity of racial conflict is not affected at all by the fact that its source is not truly racial, such conflict might well be mitigated by knowledge of the fact that it is not racial in origin or basically racial at all (*cf* Chapter XII)

WAR AND CULTURE

Warfare by primitive tribes Fighting savagely is more or less synonymous with fighting fiercely, fighting without counting the cost, and, as an illustration of Judd's suggestion that we get the form of our thought from the form of our language, the term suggests that savage tribesmen so fight To be sure warfare has been known to the majority of uncivilized peoples, although by no means to all of them, but apparently only rarely did they match modern man either in ferocity or in bravery It was not in their mores to be brave by modern standards Much of their reputed cruelty appears so mainly because their customs of war are not in our mores Witness the fact that we have not quite become accustomed to the slaughter of noncombatants We shall perhaps need to be subjected to the leavening effects of civilization for another generation before that practice becomes accepted as a legitimate act of war

The savage would probably stand aghast at the spectacle of slaughter and carnage of modern war If the number of shell shock cases is any criterion, modern man, despite the glorification of war in his literature, song, and religion of the last five or six thousand years, bears up under it none too well Sumner and Keller suggest that the methods of war of the savage in comparison with some of our own are those of a gentleman

> It is to be noted that just as primitive slavery was of a type considerably milder than one is likely to think, with the recently abolished modern system in mind, so is primitive warfare less destructive than the modern type The conflict is generally brief and loose,

casualties are often negligible, and not much use is made of the result [33]

Although warlikeness is certainly a common characteristic of primitive peoples, unwarlikeness is by no means unknown It is reported that Papuans of northeastern New Guinea cannot be persuaded to take up arms or engage an enemy in battle, although for a price they are easily induced to plunder and pillage A man of this tribe may engage in personal combat and take pride in his courage, but will not participate in formalized warfare Among other tribes of New Guinea no tribal wars were found The Todas of India make no use of weapons of war nor do certain of the tribes in the Malay Peninsula It is believed that feudal warfare has never been resorted to among the Central Eskimo Of the Canary Islanders, all were given to warlike pursuits except those of Hierro, who had no weapons and knew no war The Mirus of India are a timid, peaceable people who do not fight even in dispute The Veddahs of Ceylon "live so peaceably among themselves that strife among them is seldom heard of, and never war" [34]

Some sources of war The causes, that is, the pretexts or immediate objectives, of war may be grouped fairly accurately under the following three heads, (1) fear and anger, sometimes born of despair, (2) plunder and material gain, sometimes born of poverty and economic depression, and (3) glory or, more accurately, vanity, the fountain head of glory Among the Australian aborigines almost the sole cause of war was abduction of women and putative practices of sorcery and magical bone-pointing by neighboring tribes War for booty was practically non-existent Among the tribes of South Africa, except in periods of slave trading, "wars have seldom been about anything else than cattle" In fact some tribes have refused to keep cattle to avoid conflict with their neighbors In New Guinea

[33] W G Sumner and A G Keller, *The Science of Society*, Vol I, p 370 New Haven Yale University Press, 1927 Reproduced by courtesy of the publishers

[34] These instances are taken from Sumner, Keller, and Davies' source book *The Science of Society*, Vol 4, pp 125 ff New Haven Yale University Press, 1927

there is a "custom that a youth, before he can chew sirih that is, be counted as an adult, must have 'fetched a head'" [85] Couping an enemy, scalping, and decorations of modern times, to say nothing of the presence of statuary in nearly every city of the western world, are proof of the glory impulse in war

For every offensive war there is also a defensive one In the latter men fight in defense of their psychological possessions quite as much as they do for their material possessions They fight in defense of whatever is of great value to them Indeed in offensive wars the men who actually charge the cannon and stand on the firing line do so in large measure to extend their country's spiritual holdings In modern warfare we are likely to find the direct sources to be symbolical Even when the ostensible motive is the gaining of so material a thing as a patch of ground or a market, this material thing is chiefly of symbolical value We come to the conclusion that war in one of its primary sources is rooted in the feelings and emotions of men The homeland for which civilized men fight is more than ground and commerce and factories It is the embodiment of nearly all that is dear to them

"A man will not give his life for a business but for an ideal

While we fought for bread, England fought for 'Freedom,' and not even her own freedom, but the freedom of the little nations" — *Mein Kampf* [86]

It is reasonable to suppose that in tribal forays the provocative exigencies were much more immediate and tangible and therefore much less symbolical than they are today Pastures, watering places, and hunting ground were something to be got or held out of material necessity To civilized men their modern counterparts are psychological necessities quite as much as material necessities We find an analogy in our solicitude about food, clothing, and shelter In their quest of them vast groups of men today look upon them more as sources of satisfaction of secondary needs than of primal needs It may be assumed that we, the American people, at any time in our national

[85] *Ibid*, pp 363–364

[86] From E O Lorimer, *What Hitler Wants*, Chapter II Harmondsworth, Middlesex, England Penguin Books, Ltd, 1938

history, would have forcibly resisted attack upon our ships bent upon peaceful commerce or would without hesitation have waged war upon a nation that attempted by belligerent means to wrest from us our markets

It may be urged that our ships and markets are vital to our economic structure But in such a matter it is unlikely that we would stop to count the loss or to determine whether or not we might devise some means of getting on without them Indeed we should not be dissuaded from war should it be demonstrated that the cost of war would exceed the commercial value of all of our ships or the net profit of a hundred years of uninterrupted commerce Such is not the nature of man

We should be incensed at the violation of our rights — rights which our culture and our history books have taught us we have We need our ships and our markets less for their material value than we do for their symbolical value Have not our history books, our literature, song, and statuary taught us that we are a mighty and just people! Such an attack would be an affront to one hundred thirty million egos, more or less Then too we should be enraged by the wantonness of the aggressor and incited to humble him at any cost to ourselves

Men fight for those things which their culture has honored, which the whole fabric of their education has taught them good, brave, patriotic men always fight for These things a good man must fight for or be styled a coward, a stigma which neither he nor his children can wholly escape These things, not the corpuscles of the blood, are the stuff of which patriots are made

On preserving the peace Apparently reasoning from the observation that only well prepared nations launch a war of aggression against other nations many citizens have seriously proposed disarmament as a cure Up to now we have only succeeded in disarming the wrong people Our educational and religious orators of the past two decades certainly did nothing to preserve our security Another proposal for preserving the peace of the world, to wit an equitable distribution of the world's resources, arises from equally naive opinions of the causes of war If such were actually undertaken and carried to

completion, some of the most warlike peoples of today would actually have much less than they have had The peoples who would actually profit most are those who have been most peaceful Moreover, leaders would arise to persuade their people that an equitable distribution was unjust, that they by reason of their color, the shape of their heads, or their deeds of valor deserved more than others Men do not fight over economic conditions, but over feelings about economic conditions No German could think it worth his life and the lives of five million of his kind to gain a piece of land or a trade route, except as these are symbols of power and might and of the defeat of traditional enemies

Moreover, just treaties are equally powerless to stop wars Justice is a mental reaction, an opinion, and exists nowhere except in the minds of men It is scarcely possible to conclude a peace between two warring nations that will appear just to both parties If it seems just to one it will almost inevitably seem unjust to the other Even if there were such a thing as justice objectively arrived at it would be of no avail in such matters It is how the people concerned feel about it that counts toward war and peace Ambitious rulers could here also easily convince their people that they had been hardly treated "The skillful and unremitting use of propaganda can persuade people to believe that Heaven is Hell or conversely that the most miserable existence is Paradise" — *Mein Kampf*

Perhaps the worst proposal of the lot is the sublimation or the moral equivalence formula worst in the sense that it really purports to get at the heart of the matter psychologically Sublimation of warlike impulses smacks of the notion that these impulses well up from within and require a letting ever so often either in mortal combat or by some less destructive substitute, say tiddly winks There are certain innate impulses common alike to man and animal, but they are rhythmical or seasonal in character and are common to all men regardless of the nature of the culture in which they live Warlike impulses are not of this kind The more peaceable the pursuits of a people, the longer they have gone without war, the less warlike are they Did these impulses well up spontaneously owing to

some physiological changes within the body, the situation would be otherwise People who for generations had not known war should be restive and eager for combat Actually, unless aroused from without, a people might well live contentedly for an indefinite time without so much as a whiff of gunpowder

Seeing how our literature, history books, schools, and our whole educational process have served to make patriots, various educational reformers have advocated a thorough overhauling of the educational system at this point They have clamored for a debunking of war and its heroes, the erasure of our war culture, and a re-education of the youth with respect to our symbols Theoretically, it should be possible ultimately to carry such a program to a successful conclusion Psychologically it should be possible in time to develop a nation so cynical as to refuse to go to war on any account But as the world is now constituted such an accomplishment would be nothing short of national suicide It would stand, as must any pacifistic program of national scope only, as an open invitation to invasion Man lives by value, and he is worthless as a citizen when he holds that there is nothing worth fighting for

Pacifistic teaching, to avoid these dangers, must be positive, even militant, not the banal negative variety to which we have become accustomed It must represent an ideal, buttressed with appropriate symbols, for which men stand ready to fight The writer condones only the willingness to go to war Man's strength so to speak inheres in his great weakness, namely his setting store upon things above his life The solution seems to lie not in making men less willing to fight but in making them more concerned about amicable methods of competition Today a citizen who resorts to fist fights as a means of settling his grievances is socially ostracized, he loses caste Did nations accord similar treatment to aggressor nations, public opinion might be expected to have a coercive effect somewhat as it does in individual behavior To be sure we have courts, jails, and fines for the regulation of individual conduct and we shall probaly require these for the regulation of nations, but the fine or tenure in jail *per se* restrains men much less than the dis-

grace that accompanies them Witness the difference between tenure in a military prison behind one's own lines and those of the enemy, even when the conditions are perfectly matched objectively The latter, a man might proudly relate to his children, the former, never

Public opinion forms slowly and comes after the fact is accomplished, not beforehand Thus, as a temporary expedient, as a starting point, the writer advocates the formation of a peace-group — a "we-group" — sufficiently large to hold a balance of power and prepared to enforce its decisions By definition, lawfulness and order cannot prevail in a society if each individual is allowed to determine for himself what is right and just It means relinquishing to a degree sovereign rights By definition, lawfuless cannot prevail in the settlement of international disputes if each nation is allowed to determine justice for itself, to decide its own case and its own course of action Lawfulness requires agreement among groups and concertedness in the enforcement of the agreements Of course a court composed of a society of nations with an international army to enforce its decisions would mean the giving up of some of the individual rights of nations But indeed the whole evolution of civilization and social living is featured by the delegation to group action what the individual cannot accomplish for himself *Actually this has not resulted in the abrogation of rights but in securing them* If these lawful methods of settling conflicts between nations could once be got into the culture of the various peoples, the major difficulties would be over

Needless to say some men steal and engage in fraudulent practices as techniques of competition when it appears to them profitable to do so Similarly some nations stand ready to wage war upon others when it appears profitable to do so The whole history of the human race attests the generality of this statement Stealing and fraudulent practices are kept tolerably well under control by public opinion and penal codes We may expect to bring war under control by no less stringent measures.

As a final word it should be added that any form of supernational organization or form of government, such as a League

of Nations or a world court with "police powers," is not likely to succeed unless it becomes a symbol of the highest ideals of man It must be made capable of awakening man's best sentiments It will require a flag, a holiday, heroes, song, and statuary In short, such a venture must have symbols and can well do without pacifists of the kind we have had in too great number in our schools and churches during the nineteen-twenties and nineteen-thirties And above all we should be aware of the guile of an equitable treaty

At the present writing one hears much talk about a *lasting peace* Until such a peace is defined there is nothing in particular to talk about except the idle hope that men would ever after acquit themselves peaceably if the wrongs of the world were righted Such dupes men make of themselves! In this year of grace 1944 some say we are fighting for a lasting peace This would seem to imply that it is possible to secure such a peace It is realistic enough to aspire to the setting up of some feasible machinery for enforcing peace, but to say we are fighting for a lasting peace puts our objective on pretty shaky ground and lays us open to bitter disillusionment [87]

[87] J B Stroud, "Can Peace Be Kept Won?" *Social Education,* 1943, Vol 7, pp 251–253

CHAPTER IV

PERCEPTION AND MENTAL DEVELOPMENT

APPERCEPTION

Once when the Medes and Lydians stood opposed, ready to fight a bloody battle, the heavens suddenly darkened and the sun lost its light Then they recognized that their gods, Ormuzd and Mithras, were angry at their deeds, they thereupon lowered their weapons, and concluded a peace with each other [1]

We *sense* in an eclipse just what the original structure of the organs of mind requires "But through the ideas and skill obtained by former experience, we observe much that remains hidden to the inexperienced, and we add to the sensation numerous psychical elements from our well-stored minds, which were not immediately given in the observation The mind apprehends outer impressions in accordance with its wealth of knowledge gained through former activity" [2]

While the eclipse is *sensed* in accordance with the original structure of the appropriate organs of mind, it is *perceived* in accordance with the existing fund of knowledge (the apperceptive mass) of the individual or of the people This astronomical phenomenon which we observe with as much complacency as is possible in the presence of any great natural phenomenon has been experienced with horror by the savage When the movements of the heavenly bodies gain a fixed meaning in the religious thinking of a people, this astronomical event must, in accordance with their ruling idea, be apperceived, in the words of Lange, as a religious event By the fact that each act of perception is achieved in accordance with the present store of knowledge we can understand how the self-same event can be interpreted in so many different ways

[1] K Lange, *Apperception a Monograph on Psychology and Pedagogy*, p 89 Boston D C Heath and Co , 1893 (Translation by members of the Herbart Club)

[2] Lange, *ibid* Reproduced by courtesy of the publishers

The tiny inverted picture of the sunset on the retina of a Ruskin and the low type African are identical, but do the two men *see* the same? Nay, does the one man at different times in his life see the same world? [3]

Herbartian psychology placed great store on *apperception* — a term the use of which may be traced back at least to Leibnitz (1646–1714) The term is rarely used by psychologists today, *perception* being used instead, although *apperception* survives in educational writing The Herbartians saw in apperception one of the important psychological conditions of the development of the mind As DeGarmo said, "Apperception is then in general the process of giving significance to facts by relating them to our more firmly established knowledge" [4]

Enough has now been said to prove the general law of perception, which is this, that *whilst part of what we perceive comes through our senses from the object before us, another part* (and it may be the larger part) *always comes out of our heads* [5]

Apperception, as developed by the Herbartians, provided a psychological explanation, a partial one at least, of how education effects mental development In perception, the modern counterpart, we may see today how education achieves the same end [6]

As we shall have occasion to see in Chapter XV, one theory of how experience (education taken broadly) effects mental development is, or once was, formal discipline — a kind of exercising, as it were, of the faculties of mind However, as is suggested in that chapter, it is much easier to find opponents than proponents of formal discipline among psychologists and educational theorists of the past Locke, who had ridiculed the theory, had not provided any good substitute Locke did make frequent use of the term *faculties of mind*, a term usually

[3] B C Mulliner, introductory notes to her translation of J F Herbart, *The Application of Psychology to the Science of Education*, pp lxiv–lxv New York Charles Scribner's Sons, 1898

[4] Quoted by Mullmer, *op cit*, p lxx

[5] W James, *The Principles of Psychology*, Vol 2, p 103 New York Henry Holt and Co, 1890 Reproduced by courtesy of the publishers

[6] *Cf* H A Carr, *Psychology*, Chapter VI New York Longmans, Green and Co, 1925

linked with formal discipline, but it is not clear that this was for him more than the use of convenient terminology It remained for Herbart to show that neither the theory of formal discipline nor the concept of faculties is necessary to an understanding of how the mind develops under the impetus of education, and to propose, in apperception, an explanation of how it does develop The celebrated *formal steps* were a logical development from the principles of apperception, as is seen in Chapter XI

Knowledge of the conditions of perceptual development immediately becomes knowledge of mental development, the principles of perceptual development are common to all aspects of mental development The nature of mental development being what it is, education can take place in but one way, by adding the new to the old and in terms of the old Here, adding may stand for comparing, contrasting, synthesizing, assimilating, and so on It is a well-known fact that the people who inhabit isolated mountainous regions see relatively little in nature which is arrayed so lavishly all about Lacking old heads under which to dispose of the new, and lacking fixed concepts in terms of which to classify and compare, few definite observations about nature are made In a very real sense the function of education is to enable the individual to perceive meaning where none formerly existed, to appreciate, understand, and observe, to note uniformities and cause-and-effect relationships where formerly were mystery and superstition, and before that an abysmal emptiness "According to this, we see and hear not only with the eye and ear, but quite as much with the help of our present knowledge, with the apperceiving content of the mind" [7]

Apperception and teaching The development of the concept of apperception by the Herbartians and the celebrated five formal steps for its implementation comprises one of the great events in education From it has been drawn much of our educational theory and methodology In this respect it is rivaled only by the child-centered-activity movement of Parker and Dewey (*cf* Chapter XVI)

[7] Lange, *op cit*, p 21

If we can see how it comes about that we see and hear with our present store of knowledge as well as with our eyes and ears, we shall see one of the ways in which the mind develops, and at the same time the better appreciate what our task in education is That past experiences (or past reacting, if the reader prefers) leave certain effects upon us is beyond cavil It matters not for present purposes whether we call these *memories, knowledge, engrams, neuro-muscular traces,* or simply *effects* Once a person has experienced or reacted, his mind is no longer a *tabula rasa* These effects persist and have a part to play in his future life They provide a background for subsequent experiences This background gives meaning to the daily events of life and in part determines how they shall be experienced, *i e*, perceived and reacted to *Education thus provides a new world* The best educated persons then are those who have the best background (apperception masses) in the light of which to interpret and react to the most important events of life This conception gives a purpose to education very different from that implied in the notion that the best educated persons are those who have done the most exacting mental labor

The Herbartians did not teach that mental development takes place merely by adding the new to the old, as by a process of agglutination, although they frequently spoke as if this is what they meant A glance at the steps of teaching, which include *preparation, assimilation, systematization,* and *generalization,* should convince the student of the truth of the foregoing statement, although their phraseology frequently smacked of "atomism" (*cf* Chapter XI)

The new both colors and is colored by the old The mind is not receptive to incompatible ideas and propositions, when the incompatibility is perceived It tends to be logical, a condition that may have come about as a result of the empirical nature of mental organization For example, the mind will not accept a line as being both curved and straight A line may be curved (by a prism), as visually perceived, at one moment, and straight, as kinaesthetically perceived, at another moment, but will not appear as both curved to the eye and straight to the

hand at the same moment If the eye prevails, there will occur an illusion of curvedness to the hand New experiences are fitted into the old, extending or modifying the old, distorting the new, and extending or limiting previous generalities, and so on, but in all there occurs a tendency toward consistency and assimilation Indeed, the process of mental development is one of assimilation and synthesis Apperception masses are organized knowledge, attitudes, beliefs, sentiments, and so on, and have been so viewed by the Herbartians

The application of the principles of apperception to education has given rise to another movement, namely *psychological organization* of instruction, as well as *logical organization* Psychological organization means starting instruction at the point of the pupil's experience, without regard, if need be, to the logical organization of a subject as conceived by scholars It also means developing a subject in accordance with the pupil's level of understanding Within these limits instruction should, of course, be presented logically But this approach frees the teacher from following a completely logical, self-contained organization as worked out by the masters of a field of knowledge

This approach has given rise to the practice of starting instruction with the child's experiences, that is, with things in his environment and his scope of observation Hence the first lessons in geography are laid in the community The first lessons in arithmetic are related to the child's own experience This has led to a much greater utilization of the resources in the community for instructional purposes It has meant field trips, collections, object lessons, and the use of educational films and other instructional aids as a means of enriching the background of pupils and of preparing them for further instruction It has also led to a greater consciousness on the part of teachers of the desirability of finding out what understandings and concepts pupils have as a preliminary step to instruction A teacher cannot instruct except as instruction is related to the experiences of the pupils, but he can try He can suppose the background of pupils to be adequate when it is not, and there are degrees of adequacy of background Instruction can be

insufficiently related to the pupil's background It is probably never wholly unrelated [8]

One of the best examples of the application of the foregoing principle to teaching is found in certain phases of the readiness work in connection with beginning reading Attention is called here to the development of an experience background A popular unit of work in the first grade is *farm life* Much of the reading material centers about this subject Upon the assumption that the pupil must understand what he reads by the help of his existing concepts and knowledge, the better schools devote a very considerable portion of teaching time to the building up of acquaintance with farm life Some of this experience is direct, as provided by field trips This is supplemented by motion pictures, by the teacher, and by class discussion

We may also see the importance of this principle by observing the effects of limited background upon reading deficiencies as exhibited at the secondary and collegiate levels, discussed in certain of the following chapters, particularly V, VI, and XIII Assuming that a pupil is intelligent enough to learn to read, we may assume that his difficulties stem in large part from inadequate knowledge of the symbols of instruction or inadequate background This supposition is strengthened by the fact that his difficulties are usually not specific to reading, but also extend to listening (to class discussion and lectures) By reason of the same limitations in background and knowledge of the symbols of instruction he does not comprehend and assimilate much of what he hears The remedy, then, lies not so much in reading instruction in the narrower sense, as in a broader attack designed to strengthen his background Indeed one of the great functions of all education is to provide the necessary experience or background for future reading and learning It is by the help of this same background that a pupil is able to discern the problems and formulate his objectives when he studies his lessons Otherwise he does not know what it is he is trying to learn, and his learning tends to reduce to mere verbalism

[8] *Cf* R O Billett, *Fundamentals of Secondary-School Teaching*, pp 162 ff and 305–312 Boston Houghton Mifflin Co , 1940

As mentioned above, an outgrowth of Herbart's psychology has been a general recognition of the desirability of ascertaining, in advance of instruction, or in connection with *preparation*, the existing relevant knowledge and concepts The earlier investigations of Hall,[9] the more recent ones of Burton,[10] and others of a similar nature, have shown an alarming amount of erroneous information and misconception This is regrettable in its own right, but it is all the more serious in view of the handicap this situation imposes upon the children in their efforts to acquire new information

One learns *by* experience and *from* experience The realization that we learn by experience has led to greater emphasis upon activities and learning by doing, although educators were rather slow in making this application This does not necessarily mean more activity with the hands, though that may well be desirable It is sufficient for the present to recognize that activities and doings can be carried out with symbols, that is, in thought

But a deeper significance is to be attached to the experience-activity movement in education, or should be We learn by doing That is a truism When pupils are allowed some freedom of choice about their experience-providing activities, when they have a share in the co-operative planning of an activity or project, it is likely to be an *outgrowth of past experience* Thus they will be in a better position to utilize the principle of apperception, namely *learning from experience,* better at least than if they start work on an arbitrarily imposed task It is, of course, theoretically possible for teachers to impose learning, as it were, which follows directly from the previous experiences of the pupils However, the chances would seem to be considerably enhanced if they have a hand in the planning

Within the last two decades considerable emphasis has been given the claim that the best way to prepare children for the duties of adult life is to inculcate that knowledge and develop

[9] G S Hall, "The Contents of Children's Minds on Entering School," *Princeton Review,* 1883, pp 249–272

[10] W H Burton, "Children's Civic Information, 1924–1935," *Southern California Education Monographs,* 1936, No 7

those attitudes and abilities that are required for the solution of the problems that arise in their daily lives This attitude is justified on the ground that the education thus acquired will be meaningful

> Pupils will progress through levels of maturity, participating at each level in rich and varied learning experiences Understandings, attitudes, and abilities needed in adult life begin their growth in the nursery They will grow and expand through continuing experience until the learner emerges into adult life [11]

The foregoing conceptions of education have given impetus to one of the most important developments in the entire field of education, the designing and use of good instructional materials In the writing of textbooks and collateral reading materials there has occurred what, had it not happened so gradually, might well have been called a revolution This is obvious in mathematics, the sciences, the social sciences, or wherever one turns It is also to be seen in visual aids and pamphlets, and in the pattern of laboratory courses

NATURE OF PERCEPTION

The perceptual object Perception is a cognitive process and involves, as Carr points out, a stimulating object or event, an attentive adjustment, and the arousal of some degree of meaning — the apprehension of the significance of the object or event for some act of adjustment There may be as many kinds of perception as there are kinds of cognition One may apprehend objects through any of the senses, taken singly or collectively, and appraise their significance for conduct The various interoceptors and proprioceptors serve this purpose as well as the distance senses such as seeing and hearing

To be perceived, an object or event must be present in fact One may perceive the Tower of Pisa only if he is in a position to behold it He may *think about it* at will, regardless of his position with reference to it, and could continue to do so were it blown out of existence But perception is also a fundamental condition of thought One consummates an act of thought by

[11] W H Burton, *The Guidance of Learning Activity*, p 82 New York D Appleton-Century Co, 1944

perceiving his own self-initiated symbols Thus, mental images, implicit speech reactions, or other voluntary symbols are objects of perception and owe their character as symbols to the meaning ascribed to them by the individual In perception we apprehend some *present* object, in thought we apprehend some present symbolizing event that stands for the *absent* object In thought we represent things, qualities, or ideas, by the enactment of adequate surrogates In thought we react to that for which the stimulus stands – the character *Hamlet* or the *Sphinx of the Kremlin* – and are scarcely aware of the stimulus itself

Finally our feelings are capable of being perceived Feeling, like sensation, is itself an act of awareness, and does not depend upon perception for its existence Sensation and feeling are not dependent upon learning However, learning is a component in every act of perception A mood, an attitude, a state of euphoria or depression may be apprehended in relation to some act of adjustment, just as may a toothache or the evening paper

Attentive adjustment Perception of any complex situation is likely to be an analytical process A perceptual reaction always requires, as a preliminary condition, an act of attentive adjustment to the situation This adjustment serves to bring the situation into clear relief But attention is variable and analytical, now one aspect and now another becomes dominant As attention varies from aspect to aspect of the situation, perception likewise varies – a condition that leads to a more thorough apprehension of the situation and a more effective interpretation of its significance for conduct

The attentive adjustment has as its function a more adequate cognition of the situation It may involve several kinds of adjustment In the case of a sound the subject may turn his head in such a way as to increase the effectivenes of the stimulus or to get a better appreciation of its location In the case of vision he may adjust his eyes, turn his head, or even move his body so as to gain better advantage The eyes may be adjusted to first one aspect and then another of a complex visual object In any act of attentive adjustment the subject may

move closer to the object or otherwise put his body in a more effective position He may also hold his breath or inhibit or minimize muscular activity in general In all cases there is likely to occur an increase in muscular tensions

Representative character of perception In perception as in thought the present stimulus may be but a sign — a signal thing It may be not at all like that for which it stands It is the reaction instigated that counts Apparently any stimulus is capable of becoming a sign of anything else, under appropriate psychological conditions The printed word *horse* or the sound that designates that ungulate bears not the slightest resemblance to that for which it stands and might just as well have become a sign of *love thy neighbor* or of anything else The footprints Robinson Crusoe saw were no more like *fellow inhabitant* than *rain* Footprints mean animals or persons, certain noises, an automobile wreck, a vocal intonation, a friend, and so on, by the laws of association

Here we see one of the fundamental conditions of perception, namely, that things do not *depict* (need not, at least) but *suggest* Thus it is one of the fundamental conditions of mental development that things can mean that which they in themselves are not While all can sense objects, only the initiated can give them meaning which they themselves do not possess Meaning is not a property of objects, but a condition ascribed to them by perceiving organisms An object does not change when its meaning changes, the individual who perceives it changes Brentano made this the distinction between physics and psychology

Redintegration "Perception is a typical mental redintegrative sequence, in which an act or verdict or other event is dictated by a partial feature (clue, sign, symbol) of a previous complexity The interpretation of such clue or sign is a typical perceptual activity"[12] This characterization of perception as a redintegrative process signifies a good deal about the nature of mental development as well as about perceptual activity It implies a kind of mental organization with

[12] H L Hollingworth, *Psychology Its Facts and Principles*, pp 115–116 New York D Appleton-Century Co , 1928

respect to each perceptual object Hartley appears to have developed the same idea (see Chapter XI)

Perceptual objects are normally quite complex A piano, for example, has certain characteristics of sound, size, color, shape, weight, structure, and odor, to mention its more outstanding features These features become organized into a functional system or concept This phenomenon in itself gives us important insight into the nature of mental operation Data presented to the various senses and resulting in nervous reactions in as many different parts of the brain, and data presented at various times in one's life (if perceived to relate to the same object) become organized into a kind of functional whole

A second important fact of mental life is that the presence of one, or at most a few, of the features of an object may lead to the mental instigation of the whole — lead to the verdict *piano* The odor of an orange is a clue to orange, the tone of a piano is a clue to piano, certain well-known footsteps signify Mr Brown By reason of these two facts it comes about that objects are recognized, named, and otherwise reacted to even though only partially presented to us The footsteps stand for Mr Brown, the odor stands for orange, and so on

One perceives a stimulus pattern as an automobile accident, a shipwreck, a tropical storm, a fire in the neighborhood, an amorous mood, a hostile act, and the like, not as a number of separate stimuli These are situations to which names previously learned and concepts previously formed apply Without so much as a passing thought to the separate elements in the stimulus pattern, one reacts to the stereotype, to the thing which they mean The various stimuli are unified, as it were, by virtue of the label which is attachable to them Thus it becomes clear that names are very useful in perceiving as well as in thinking and communicating

SOME CHARACTERISTICS OF PERCEPTUAL DEVELOPMENT

In his excellent book *Comparative Psychology of Mental Development* Werner makes use of the following pairs of concepts, which, he avers, are useful in defining the genetic levels of

mentality syncretic-discrete, diffuse-articulated, rigid-flexible, and labile-stable Perceptual development may be said to proceed from the condition implied in the first member of each pair of concepts to that implied in the second member, that is, *discrete* is more advanced than *syncretic, articulated,* more advanced than *diffuse,* and so on [13]

Syncretism-discreteness Syncretistic perception is immature, discrete perception is mature The perceptual reactions of the animal, the child, and primitive man tend to partake heavily of the syncretistic character, although the phenomenon is encountered to some extent at all levels of development The word *syncretism* denotes a joining or attempted joining of conflicting or incompatible things In a sense, it signifies overgeneralization A few illustrations will suffice to clarify its meaning in its present usage It is a well-known fact that the child who has just learned the word *papa* may apply the word rather indiscriminately to all men In a similar way he may apply the term horse to any large quadruped To a hungry frog, almost any small moving object is a thing to eat, to a robber-wasp, suggests Werner, " any form that suggests a fly, even though it is only the head of a nail driven into the wall, will possess the signal-properties of an object of prey " As an additional illustration, he recounts some observations of E G Sarris on the properties of objects in the dog's world The animal was taught to jump upon an ordinary chair at the command " chair," and to lie down in a basket at the command " basket " Any object — chair, box, small table — capable of being jumped upon was found to have the significance of "chair ", and any hollowed-out object, kennel, coal bucket, or basket, had the sigificance of " basket "

In a sense perceptual development is a matter of refinement An instance has been recounted in which a small child who, in handling some flowers in a pot on a terrace, was stung by a bee For a time thereafter the child studiously avoided flowers and flower pots, and refused to go near the terrace He had not learned the essential and non-essential elements in the situation

[13] H Werner, *Comparative Psychology of Mental Development* New York Harper and Brothers, 1940

Rubinow and Frankl, as related by Werner, observed five genetic steps in the sucking response of an infant The response is elicited (1) when there is a sudden movement of an object (presumably of various objects) toward the child's mouth, (2) when there is a sudden movement of any *pointed* object toward the child's mouth, (3) when there is a similar movement of any object capped by a nipple or of any nipple-shaped form, (4) when (at about the age of 6 or 7 months) objects containing a white substance and capped by a nipple, stationary or in motion, are seen, (5) when (at about the age of 8 months) any object containing white liquid is seen

Werner makes the point that objects for a child are less objective, less self-subsistent than they are for a more mature person They are not so readily abstracted, there is less separation between object and subject The tendency to attribute human qualities to inanimate objects is rather pronounced among children The perceptions of children tend to be colored more by the personal factor than do those of adults The influence of the personal factor is what Piaget has called *egocentrism* in perception [14]

Diffuseness-articulation This pair of concepts is closely related to the preceding pair Perhaps perception is diffuse because it is syncretistic, articulated because it is discrete In diffuse perception objects are not articulated, detached things, but form a constituent part of a whole, the objects merely being the dominant elements in a situation

In a restricted sense diffuse perception is less mature than is articulated perception A case in point is Volkelt's oft-cited observation that the domestic spider will attack a fly only when caught in her outer web If a fly chances to enter the narrow funnel in which the spider awaits her prey, she not only refuses to attack the fly but actually flees from it Says Werner, in commenting on Volkelt's observations, a fly is not to the spider a self-subsisting thing, but an intrinsic part of the whole situation He points out that the "dominant signal" in the situation is probably less visual than vibratory, in support of which he

[14] J Piaget, *Judgment and Reasoning in the Child* New York Harcourt, Brace and Co , 1928

cites Gruenbaum's observation that a spider, under investigation, would vigorously attack a vibrating wire thrust through the meshes of the web, although this stimulus could not possibly serve as an article of food In fact in one experiment, the spider without hesitation passed directly over a lump of fly meat placed in her path, in order to reach the vibrating object

These examples of diffuse, unarticulated perception are certainly lacking in that maturity which we should expect in a higher order of mental development In some situations diffuseness as here defined is a mark of immaturity, but in others the reverse is true A person who responded to a panther in a strong cage as he might in a forest could not be said to display any high degree of maturity in judgment Intelligent adjustment requires that the significance of an object be appraised in the light of the context or total relevant situation in which it is encountered Maturity of perception is best judged by the success of the perceiving organism in effecting adequate adjustment to the situation at hand Incapability of perceiving objects as clearly delineated, self-subsistent things is surely a mark of immaturity, but in order to avoid the mistakes of rigid, inflexible behavior, it is necessary to perceive them in relationship to the total relevant situation

Rigidity-flexibility. Diffuseness and rigidity (and articulation and flexibility) are not contradictory but complementary concepts A condition to an inflexible response is a diffuse, slightly articulated stimulus pattern A condition to a flexible, adaptable, labile response is the perception of an object as a discrete, self-subsistent thing, not as a syncretistic thing composed of essential and non-essential elements Thus flexible behavior requires as one of its circumstances a sharp delineation of the elements in a situation that belong, as over against those that are merely incidental However, a condition of mature mind is also the ability to perceive objects in the light of all the significant attendant circumstances

Meaning and association Since perception is a process of interpreting situations in the light of their significance for conduct, the problem of perceptual development is one of explain-

ing how situations come to be meaningful This problem is continuous with the larger problem of learning The basic conditions of learning are also basic to the development of perception To the infant, the flag of his country, a kiss on the forehead, or a derogatory remark about the *I Q* of his father is relatively devoid of meaning In the course of time they may, however, come to mean various things to him, depending upon his experience The meaning of a situation is mediated by the partial arousal, symbolically or otherwise, of former responses associated with it This notion is in accord with the Hartley-Hollingworth principle of redintegration, mentioned previously.

PERCEPTION OF VISUAL SPACE

The role of learning When we behold a book lying before us or view the top of a desk, we perceive a rectangular object We know from photography and from the laws of optics that the image cast upon the retina is not rectangular All the chairs in one's office look to be about the same in size, if indeed the manufacturer so fashioned them, regardless of their distance from the observer Yet they do not produce images of equal size upon the retina Two chairs of the same construction, one being twice the diameter of the other and twice as far removed from the observer, cast images of equal diameter upon the retina They are not perceived as being equal in size, and cannot be so placed in a room as to deceive the eye, although such deception is easily practiced on a camera As one looks along a corridor, the ceiling does not tend to meet the floor nor the walls to converge It looks to be about as high and as wide in one place as in another It is clear that perceptible size does not conform to the laws of optics which the camera must obey Persons fifty feet away appear to be practically as large as those but ten feet away

Presumably the fact that convergence, size, brightness, and other factors used by painters, produce illusions of depth comes about from the fact that in normal experience with the world of space these factors have been found to vary with empirically known variations in distance In a painting or a photograph converging lines, somewhat similar to those cast upon our ret-

mae in real life, and variations in size, brightness, and the like produce illusions of depth on a flat canvas One interpretation is that in the course of experience we learn what kind of impressions objects of varying shape and size and distance make, and come to perceive them in that manner because we have found, by empirical test, objects making those impressions to be such in size, shape, and distance

Some of the facts of visual perception of space are briefly recounted in the following pages, partly to illustrate this aspect of mental development, and partly to review some facts utilized in the discussion of reading in the ensuing chapter

Visual perception of distance (1) *Monocular signs* Monocular signs are of two kinds, patterned and unpatterned The principal *patterned* monocular signs are interposition, position with respect to the horizon, and light and shadow If a horse obscures a portion of a barn, the former is interposed between the latter and the observer and is therefore nearer to the observer If the barn obscures a portion of the horse, we have the reverse In life situations the more remote objects appear to be nearer the horizon, on a flat canvas the artist creates the illusion of distance, in part, by placing objects near the top or the sky line The efficacy of light and shadow is demonstrated in a relief map The number of intervening objects and their patterning are also utilized in the perception of distance

Among the *unpatterned* monocular signs may be listed size, intensity or brightness, saturation of color, clearness, and presence of detail Size (area) and intensity vary inversely with the square of the distance, clearness and visibility of detail are dependent upon size and intensity The saturation of color decreases as the distance increases An examination of a landscape painting will demonstrate the efficacy of these monocular signs

(2) *Binocular signs* The binocular signs are *retinal disparity* and *convergence,* the former is a patterned, retinal sign, the latter is a muscular, non-retinal, sign Convergence is discussed presently under another head Retinal disparity refers to the dissimilarity in the two retinal images produced by three dimensional objects The nearer the object, the greater is the

amount of disparity in the two retinal images — the more there is that is peculiar to each image and not common to both Binocular disparity does not operate in the case of two dimensional objects, as in photographs and paintings In fact monocular vision gives better depth in a painting than does binocular vision

(3) *Convergence and accommodation* There are two muscular signs of distance, convergence (of the two eyes) and accommodation (of the lenses) The nearer the object, the larger is the angle of convergence and the greater is the muscle strain involved in the accommodation of the lenses The eyes automatically make these adjustments and the sensations arising from the muscular contractions become signs of distance They are most effective at shorter distances, those within a few feet of the observer, and become progressively ineffective as the distance increases

(4) *A historical sketch* Berkeley appears to have been the first to call attention to the function of these non-visual cues in the perception of distance He put forth the argument that distance is not something which is seen or otherwise sensed, but is perceived in terms of other sensory cues (1709) To the physicist Wheatstone goes the credit for having published the first observations on retinal disparity (1838) Leonardo da Vinci (1452–1519), working on the principle that "the picture must duplicate as closely as possible what is presented to the eyes in looking at an object or scene," deduced the patterned and unpatterned monocular signs, as listed previously [15]

Single and double binocular vision In the binocular field there are certain conditions under which single objects are seen singly and others under which they are seen doubly, or are capable of being so seen Likewise there are conditions under which two or more objects are seen separately and others under which they may be seen as one A single object (within the binocular field) is seen singly when the retinal images fall upon corresponding retinal areas and doubly when they fall upon non-corresponding retinal areas The eyes move co-

[15] R S Woodworth, *Experimental Psychology*, pp 651–656 New York Henry Holt and Co , 1938

ordinately — a condition that normally insures single vision at the focal point Objects other than those at the focal point cast images upon non-corresponding retinal areas and are, therefore, susceptible to doubling Doubling is not an obvious phenomenon as is shown by the fact that only the most careful observer, or one schooled in such matters, is aware of it It is probable that individuals in normal experience learn to ignore the doubling by virtue of its irrelevance, just as, by analogy, they learn to ignore the blind spot

While the eyes normally move co-ordinately in such a way as to achieve unitary vision, some persons are sufficiently lacking in muscular balance as to create a reading problem This problem is discussed further in the following chapter

Strabismus In strabismus we find a permanent condition favorable to double vision, although persons so afflicted are usually able to achieve unitary vision There are three kinds of strabismus, convergent, divergent, and vertical — any one of which may disrupt the unitary character of binocular vision When the foveal area of one eye is stimulated by a fixated object, a portion of the parafoveal area of the other eye is necessarily stimulated We know that in normal eyes this or any other condition that brings the two images to non-corresponding retinal areas may produce doubling or diplopia However, only a small percentage of persons suffering from this condition are incapable of achieving unitary vision It is thought that the majority of them achieve unitary vision, in the binocular field, by virtue of a squint which is usually acquired with respect to one eye in early life The image in the squinting eye is said to be repressed Moreover, the image on the parafoveal area is not so clear as that achieved on the foveal area of the other eye and may, with training, come to be ignored, just as in normal-seeing persons doubling of objects without the fixation point is ignored

While a strabotic person may escape the disadvantages of double vision, he does not at the same time enjoy the normal advantages of binocular vision in the spatial localization of objects He remains at a considerable handicap in depth perception

Visual perception of size The fact that the size of the retinal image is a function of the size and distance of the object makes it clear that the perception of size and perception of distance are interrelated With perceived distance constant, the larger the retinal image the larger is the object perceived to be But all large-image producing objects are not perceived as large, nor are all small-image producing objects perceived as small A dime held at one position may produce a larger retinal image than a wagon wheel held at another position, but is perceived as being only a small fraction of the latter's size Hence size of retinal image, together with the signs of distance, is a determining factor in the perception of size Convergence and accommodation may be utilized also in the perception of size

Perception of movement Three senses supply data for the perception of movement of objects with reference to each other or to the individual, namely vision, touch, and hearing. These three senses and others, notably the kinaesthetic and the static, operate independently or in collaboration in the perception of movement of the individual with reference to objects in his environment Perception of movement is conditioned upon changes in the local signs In many instances the movement of an object with reference to the individual and the movement of the individual with reference to an object produce the same changes in local signs This situation produces no confusion if the movement of the individual is self-initiated, in which case it never occurs to him that the succession of changes in local signs is a consequent of anything other than his change of position with reference to the objects There are occasions, however, in passive movement when confusion does result, as on a train in a railway station where, frequently, there is uncertainty as to whether one's own train or another on an adjacent track is in motion

Apparent movement The simulated movement to which we have become so accustomed in the cinema has as its basis an extremely interesting illusion The perceived action on the screen is not action at all, nor is it produced by movement in the ordinary sense of causing projected objects to move The

latter would not show action, but simply lifeless objects passing before our eyes The apparent motion is produced by a series of successive still pictures presented in a certain temporal and spatial relationship to each other If two lines, dots, electric sparks, or other objects separated from each other by about 1 cm (at reading distance) are presented one after the other within an interval of less than 030 of a second, the two objects will be perceived as simultaneously exposed If the two exposures are separated by an interval as long as 200 of a second, each is seen successively in its own place When between these limits (the optimal being about 060 of a second) the exposure of one such object follows that of the other, but one object is perceived and this gives the appearance of moving from one position to the other [16]

Spatial agreement of the senses It is a well-known fact that objects are perceived spatially in terms of more than one sense and that the various senses normally agree rather well as to the localization of objects Objects are seen, heard, and felt, as being the same object and in the same place There is some reason to believe that this co-ordination on the part of the various senses is acquired through experience At any rate, co-ordination disrupted experimentally may be re-established through learning, as in Wooster's experiment Her subjects wore prismatic lenses which deflected visual objects 20 degrees to the right They practiced localizing reactions to an electric buzzer, being instructed to touch it with the right hand In the initial trials all reactions were too far to the right With continued trials this systematic error was reduced and finally eliminated This they could have learned to do had there been no sound, but it is significant that, when successful localizing reactions became established, the subjects heard and saw the buzzer in the same place [17]

[16] R S Woodworth, *op cit*, pp 680–683

[17] M Wooster, "Certain Factors in the Development of a New Spatial Co-ordination," *Psychological Review Monographs*, 1923, Vol 34, No 4 *Cf* P T Young, "Auditory Localization with Acoustical Transposition of the Ears," *Journal of Experimental Psychology*, 1928, Vol 11, pp 399–429 G M Stratton, "Vision without Inversion of the Retinal Image," *Psychological Review*, 1897, Vol 4, pp 341–360, 463–481

As an explanation of the development of the phenomenon *spatial agreement of the senses* Carr has proposed what is termed a motor theory As is seen in Chapter XI, direct association between two sensory objects is only a simulation, the two objects are thought to be associated actually by virtue of their connection with a common response Carr's motor theory is an adaptation of this conception of association to the phenomenon of spatial agreement The co-ordination is effected putatively as a result of the fact that the local signs of each sense become associated with a localizing reaction that is common to all senses involved Each localizing reaction of a certain kind – touching, pointing, approaching, describing verbally or pictorially – to be correct in each instance must of necessity be common to each sense [18]

PERCEPTUAL DEVELOPMENT OF CHILDREN

All the foregoing applies to the perceptual development of children In the present connection are presented the results of some of the investigations by child psychologists relative to perceptual development in special areas

The previous discussion of "some characteristics of perceptual development" is appropriate to the present topic The perceptions of young children are more syncretistic, unanalytical, or less discrete than those of older children and adults Thus, a feature of perceptual development of children is a tendency to become more analytical and more discrete [19] Curti cites the case of a child who applied the word *string* to any string-like object, such as wire, hair, and ribbon This and the other examples of syncretism cited earlier are clearly instances of the associative *law of assimilation* (*cf* Chapter XI) The perceptions of educated adults also tend to be largely syncretistic when the perceptual situations are novel and complex One of the functions of learning is to make them more discrete, more analytical Since most perceptual situations partake

[18] H A Carr, *Introduction to Space Perception* New York Longmans, Green and Co , 1935

[19] M W Curti, *Child Psychology*, p 286 New York Longmans, Green and Co , 1938

heavily of novelty for very young children, it follows that syncretistic perception is common to them

To say that perceptual development is featured by a shift away from syncretism and toward discreteness is to say that perceptual development proceeds from the general to the particular, from the whole to the parts Here the whole is first and is not made up by adding part to part This point of view seems consistent with the position of traditional American psychology [20]

In the normal course of mental development the perceptions of children become less diffuse and more articulated, that is, more abstracted and self-subsistent This comes about as a result of being able to discern the significant elements in a total situation The ability to discern essential and non-essential elements in a perceptual situation is basic to flexible, adaptable behavior, behavior that is appropriate to each particular circumstance, as opposed to rigid, inflexible behavior Intelligent behavior is conditioned by the ability to perceive objects in the light of all their significant attendant circumstances

Children's drawings Some child psychologists have regarded the analyses of children's drawings as being pertinent to the problem at hand No doubt analyses of these products are quite revealing It is not clear, however, just what insight they supply about the perceptual development of children They show a good deal about the general developmental level of their mentality Indeed there is a fairly satisfactory intelligence test based upon drawing a man [21]

As Nagge points out, the first drawings of children are made chiefly from memory They tend to be conceptul representations, rather than drawings of models as perceived In drawing a man young children frequently show members of the body

[20] It is true, however, that *Gestalt* psychologists (*Cf* Chapter XI), who, by the way, have done some very fine work in perception, have performed a service by emphasizing this point of view On the other hand it is just as true that in the formation of concepts development proceeds from the particular to the general, from the parts to the whole

[21] F L Goodenough, *Measurement of Intelligence by Drawing* Yonkers-on-Hudson, New York World Book Co , 1926

beneath the clothing, or in drawing a house, show the interior arrangement or place windows on the back side[22] Another feature of the drawings of children, is what Piaget has named *juxtaposition*, the joining of objects without reference to their proper relationship to the whole An oft-cited illustration is a drawing reported by Voelkelt, made of himself by his daughter (about five years of age), in which the teeth, signified by a row of round objects, were placed on top of the head

These characteristics of children's drawing may show immature perceptions of the drawings as evaluated by the children But we have no right to assume that they represent the actual perceptions of the objects drawn For example, juxtaposition, as opposed to synthesis, in the drawing of man does not signify juxtaposition in the actual perception of a man These characteristics may reveal immaturity in *conception*, but hardly immaturity in perception

Perception of number It has been found that children four-and-a-half to six years of age can report accurately the number of objects exhibited instantaneously up to two, fairly well up to three, and to some extent up to four Some of the difficulty experienced at this age may be occasioned by immaturity of number concepts and lack of number names Conceivably this difficulty could be mitigated by having the children indicate the number by analogy, as by drawing marks, rather than by name Incidentally, it is interesting to note that children are usually able to count aloud — name numbers sequentially — before they can count objects and tell how many

Perception of size and form Children are able to perceive differences in size at an early age, possibly as early as they are able to understand the instructions Conceivably they might do so earlier under favorable experimental procedures In one investigation children ranging in age from two to five years were tested for ability to select the middle-sized box of three boxes Most of the two-year-old children failed All the

[22] J W Nagge, *Psychology of the Child*, p 139 New York The Ronald Press Co , 1942

others mastered the problem, though with varying degrees of effort Speed of mastery was positively correlated with mental age [23] Thurm found that for a group of children aged two to five years, the largest of a group of objects was the most easily detected, the smallest next The middle-sized was the most difficult of all We must, of course, take care that the difficulty is not in the words or in the child's conceptions, rather than in his ability to perceive differences in size or form [24] A child fifteen months of age was found to be able to distinguish circles, squares, crosses, and triangles, taken in pairs, under well-controlled experimental conditions [25] It should not be surprising that a child of this age can make form discrimination A rat can do as much

Perception of time Children are reputed to have a notoriously poor sense of time But much of the deficiency appears to lie not necessarily in inherent weakness in time perception *per se* It may be owing to the difficulty involved in the mastery of a complex and abstract set of symbols – the clock and calendar, for example – employed by adults in the reckoning of time For one thing the utilization of these symbols requires considerable understanding of a highly abstract number system Without the constant aid of these artificial devices our own perception of time would be much less efficient than it is There is also a fairly complicated language of time to be learned, such as yesterday, tomorrow, week, next week, last month, and so on, some of which involve concepts very difficult to learn Furthermore, the child's life, with respect to the temporal sequence of events, is regulated in large measure by others He has not learned the significance of a vast number of daily happenings with the thoroughness of adults, nor is his world so complex, nor so routinized A factory whistle, the passing of a postman, the position of the sun, the tide, the state

[23] J S Hicks and F D Stewart, "The Learning of Abstract Concepts of Size," *Child Development*, 1930, Vol 1, pp 195–203

[24] M E Thurm, "The Development of Concepts of Magnitude," *Child Development*, 1935, Vol 6, pp 120–140

[25] N L Munn and B R Steining, "The Relative Efficacy of Form and Background in a Child's Discrimination of Visual Patterns," *Journal of Genetic Psychology*, 1931, Vol 39, pp 73–90

of fatigue or hunger, and various other events are more firmly established as clues of time for the adult than for the child

Time perception means different things, each of which has its own set of problems Except for very short intervals, those not exceeding approximately four seconds, we cannot perceive time directly, as it were For longer intervals our perceptions depend upon clues which are indirectly related to time, but which of themselves have nothing to do with time Most of our judgments of time are, therefore, *inferences*, made possible by what to a child must seem like a complicated set of symbols and a vast amount of learning

Like distance, time is not made up of a series of discrete and discernible units, and like greater distances, greater intervals of time can be comprehended only by the aid of arbitrary and abstract symbols The child comes to understand the meaning of these symbols by the aid of the very devices our ancestors used in keeping track of time, such as the seasons, the number of "sleeps," and the number of "suns" (*cf* Chapter VI)

It is not surprising then that children have difficulty with the longer periods of time, and, owing to the abstractness of time symbols, it is not surprising that ability to deal with them is one of our best indices of the level of intellectual development of children It should be noted, too, that time perception involves a large element of memory This is seen in responding to the simple question "Is this morning or afternoon?" Obviously it involves keeping track of the days of the week, the month, days of the month, and year

It is probable that young children compare much more favorably with adults in perception of shorter times, especially when the problem is uncomplicated by the mastery of a complex system of chronometry For example, in the ability to reproduce short intervals of time or to discriminate between intervals of different length, in the ability to reproduce various rhythmic patterns or to tell whether two such patterns are the same or different, it may be that children are not nearly so deficient as they are in the ability to deal with the conventional methods of reckoning time This supposition is supported to an extent

by the phenomenon of anticipatory responses which experiments in conditioning have shown to be capable of development in young infants and animals [26]

[26] R W Kantrow, "Studies in Infant Behavior IV An investigation of conditioned feeding responses and concomitant adaptive behavior in young infants," *University of Iowa Studies Studies in Child Welfare*, 1937, Vol 13, No 3

Cf W Line, "The Growth of Visual Perceptions in Children," *British Journal of Psychology, Monograph Supplement*, 1930, Vol 5 F Pistor, "How Time Concepts Are Acquired," *Educational Method*, 1940, Vol 20, pp 107–112 R Updegraff, "The Visual Perception of Distance in Young Children and Adults," *University of Iowa Studies Studies in Child Welfare*, 1930, Vol 4, No 4

CHAPTER V

READING AND ITS CONDITIONS

There is no better example of the influence of man's cultural history upon his mental development than that afforded by reading This is seen in the formal methods of teaching reading, in the alphabet, in printing and in everything that goes into the making of a book – the paper used, the language, and the reading content itself Every one of these features of the book had a very long history, no one of them was produced *de novo* To the extent that reading is a factor in mental development, to that extent is mental development dependent upon cultural transmission

COMMENTS ON THE HISTORY OF READING AND WRITING

Reading, as we know it today, is one of the late achievements of man But it is only the highly developed skill of reading printed text that is numbered among the modern achievements While today probably not more than one-half of the peoples of the earth have this attainment, it would be a mistake to suppose that the rest cannot read at all Reading in some form has been practiced in all stages of civilization If reading be defined as the interpretation of graphic symbols, it is many thousands of years old Reading, we may surmise, is as old as sign-making If reading be made to include gesticulatory signs, it is as old as language itself If it be restricted to the interpretation of graphic language, it goes back at least to the old stone age

Reading as a perceptual act Reading is a perceptual process *par excellence* Psychologically, the interpretation of gesture, graphic art, or the printed page is not different from other perceptual activities The mariner who reads the stars, the Indian warrior who reads the moss on the trees is reacting to meanings, to inferred significance, not to sensory data actually given – like color or brightness And so does the man who per-

ceives one object as near and another as remote, for there is no distance sense, nor any direction sense Perceived distance and direction are interpretations or inferences The perceiver reacts not to what is seen but to what the seen things signify The brave who reads the moss on the trees, hoof-prints of horses, the bent twigs, the twisted grass, the smoke signals, the pictographs inscribed on the face of a rock is in each case making a similar psychological reaction He is going beyond the sense data actually given He is reacting upon the basis of the signal properties of the stimuli His reactions are dependent upon his optical mechanism, but not determined by it as are brightness and color, he is "seeing" with his existing store of knowledge Such is the character of all perception The man who perceives a congeries of noises as an automobile wreck or who reads an account of it in his local paper ascribes to the sound or to the printed symbols, these signal things, what is neither heard nor seen, namely meaning Thus reading differs from other forms of perception merely in that the sense data belong to the field of graphic language and as such have been provided by another for purposes of communication

Stages in reading and writing Clodd is of the opinion that writing had long since passed the pictorial stage in Babylon by 6000 B C Egyptian writing was partially alphabetical so long as 7000 years ago [1] Inscriptions dating back to 3000 B C have been unearthed in Crete "In all these cases, and especially in Egypt and Babylonia, there are abundant indications that reading and writing were already most ancient practices, with the story of their origin enshrouded in mystery, and told only in myth and legend" [2]

Various peoples and tribes on every continent have developed systems of writing, independently Some of these systems have reached a high state of completeness, some have been arrested at one or another stage, some are still in their rude beginnings Yet so far as each has gone it resembles almost every other in the general lines of its development One finds most striking resemblances, even

[1] E Clodd, *The Story of the Alphabet* New York D Appleton-Century Co , 1900, 1915

[2] E B Huey, *The Psychology and Pedagogy of Reading*, p 187 New York The Macmillan Co , 1908

in details, in comparing such widely separated systems as the Maya of Yucatan with the Egyptian, or the Ojibwa of North America with the Babylonian [8]

It is reasonable to suppose, as has often been suggested, that the first form of writing was executed by means of gesture and that this "drawing in the air" was genetically prior to picture writing Whatever paleolithic man may have practiced in the way of gesticulatory and verbal language must be left to the imagination, but specimens of his graphic language endure to this day Hirn says of the earliest drawings of man "these designs are only a projection on a different surface [sand, bark, bone, and stone] of the hand movements with which in their pantomimic language they describe the outlines of the objects in the air One is tempted, therefore, to find in these transferred gestures the origin of pictorial art" [4] In support of the contention that the art of picture writing is unbelievably old, Clodd cites archeological finds of drawings of animals now extinct, notably those discovered on cavern floors of France and Belgium [5]

(1) *Pictographs* The earliest pictographs of a tribe — those representing the beginning of graphic language — bear considerable likeness to the object portrayed, although imitative fidelity was not insisted upon The economy of sketching a few essential details was generally practiced Later a whole was represented by a part — a paw, a head, and the like Both of these practices follow the normal operations of perception wherein a part may stand for or reinstate the whole of which it was formerly experienced as a detail — instances subsumed under the Hartley-Hollingworth concept of redintegration With further evolution, signs became more and more conventionalized, with the consequence that likeness between pictograph and object could be dispensed with altogether Here we see a movement toward the symbolical and away from the strictly pictorial Further evolution took place in the direc-

[8] *Ibid*, p 188 Reproduced by courtesy of the publishers

[4] Y Hirn, *The Origins of Art*, p 156 London Macmillan and Co, Ltd, 1900

[5] *Op cit*, p 22

tion of convenience in portrayal Huey suggests that a factor in the evolution of the ancient Chinese character for sun from ⊙ to 日 and for moon from ☽ to 月 was the greater ease of drawing with the Chinese brush-pen Similarly the character for song 口 (mouth and bird) becomes 鳴 and that for light 明 (sun and moon), 明 Likewise, ⌒, a conventionalized simplification of a stair, becomes the symbol for sky [6]

(2) *Ideographs* Conventionalized characters, substituted for pictographs, are known as ideographs Conventionalization had the advantage of permitting the symbolization of feelings and abstract ideas as well as concrete objects Ideograms were metaphoric to a considerable degree Huey tells us that the Egyptians, curiously enough, represented mother by a vulture, a bird thought to nourish its young with its own blood, a king by a bee, signifying a monarchical form of government, justice by an ostrich feather, the feathers of this bird being supposedly of equal length, knowledge by a roll of papyrus, this being the chief writing material of that day The Dakota Indians symbolized plenty by a buffalo head, pit, and a forked stick denoting support for the drying pole The Ojibwa represented winter or the season of snow thus 冬 The meaning of the red tomahawk and the pipe in Indian lore is well known [7]

Says Clodd, "As the characters pass from the pictorial to the emblematic or the symbolic, their meaning, obviously, becomes more obscure, save to the initiated They do not [he quotes from Mallery] depict, but suggest objects, do not speak directly through the eye to the intelligence, but presuppose in the mind knowledge of an event or fact which the sign recalls The symbol of the ark, dove, olive branch, and rainbow would be wholly meaningless to people unfamiliar with the Mosaic or some similar cosmology, as would be the Cross and the Crescent to those ignorant of history" [8]

In the more advanced stages of ideographic writing, like the Egyptian and Chinese, modifiers or determinatives increase tremendously the number of ideas a symbol may be made to ex-

[6] *Op cit*, pp 198–199 Reproduced by courtesy of the publishers
[7] *Op cit*, pp 196–197
[8] *Op cit*, p 66

press For the Chinese, the symbol of white with the symbol for a tree as a prefix stands for cypress, with the symbol for man as a prefix, it stands for elder brother [9]

(3) *Phonograms* Phonograms are written characters that symbolize the names of objects rather than the objects themselves The development of spoken language had created a need of graphic symbols which could be made to represent the sounds of spoken signs This would, says Huey, solve for all time the problem of facile communication Inherently, phonographic writing has no particular advantage over ideographic writing, save the fact that it served as an important intermediate step between ideographic and alphabetic writing It was a step in the right direction as it drew attention to the fact that graphic characters could be made to symbolize word sounds, as they became constant symbols of those sounds within any language system There was one very practical advantage in phonographic writing, in that it made the fullest possible use of oral language structure A person did not have to learn two separate languages, so to speak — one for reading and writing and another for speaking The same words and syntactical elements were used by two different methods of expression In fact phonographic writing presented a situation quite similar to that confronting our youth today as they learn to read — as they undertake to learn the written form of words with which they have already become familiar in oral form Here knowledge of word meaning, sentences, parts of speech, grammar, and syntax learned in speaking situations, *transfers* to reading situations and makes the process of learning to read very much easier

However, phonographic writing has all the disadvantages inherent in ideographic writing Whereas in the latter there are required as many signs as there are ideas, in the former there are required as many separate characters as there are words As Huey suggests, it was a long time before men came to realize that all the words used in speaking, or all that ever shall be used, can be expressed in a few elementary sounds The employment of visual signs for word sounds without any considera-

[9] Huey, *op cit*, p 200

tion of the sounds' inherent meaning freed the writer from all obligation to produce in the written symbol any likeness to the thing symbolized

The Chinese language is made up of monosyllabic words Since there are but a few hundred of these, each word sound must have several meanings In their written language these homophones present a considerable problem since, as their language is non-alphabetic, they cannot vary the spelling as we do in the case of our homophones, as in *write, rite, right,* and *wright* This difficulty is circumvented by the placing of an ideograph, as a key or determinative, after a phonogram Taylor informs us that the phonogram *Pa* has eight distinct significations — that there are eight different words so pronounced When followed by the ideographic key for plant it means *banana tree,* when followed by the key for iron it denotes *war-chariot,* when followed by the key for mouth, it denotes *cry,* and so on He further relates that the Chinese written language practically requires but 1144 phonetic signs and 214 ideographic keys And "by means of these 1358 conventionalized pictures, taken in groups, two and two together, any one of the 40,000 words in the Chinese language can be written down without ambiguity" [10]

(4) *The alphabet* Taylor suggests that one of the prices the Chinese have had to pay for their failure to analyze their monosyllables into an alphabet is the taking of 20 years to learn to read and write, instead of 5 Clodd agrees that this is theoretically correct, but points out that for practical purposes the Chinese can do with considerably less than complete mastery of the language Without doubt the alphabet is one of the truly great intellectual achievements of all time The fact that we can write the 600,000 words in our language with the use of 26 letters is proof of its economy

The cuneiform writing of Chaldea, Babylonia, and Assyria, like the written language of the Chinese, progressed from the pictograph and ideograph stages to phonograms and syllabary, together with homophones and determinatives At this stage

[10] I Taylor, *The Alphabet,* Vol 1, pp 28 ff New York Charles Scribner's Sons, 1899

development was arrested, just as with the Chinese Of the cuneiform writing, probably all, according to Huey, except the Persian, stopped short of the development of a true alphabet The Egyptians made the momentous step at an early date, although they merely added alphabetic writing to their pictographs, ideographs, and phonograms "But the scribes clung to their ancient characters with a greater tenacity even than we do to our silent letters, and the writing of Egypt remained a confusion, their magnificent discovery going begging for a nation that could make use of it" [11]

It is not within the scope of the present treatment to attempt to determine who were the first people to rely wholly on alphabetic writing Suffice it to say that the Greeks adopted such a system and that our system is derived therefrom by way of the Latin

Materials and arrangement Finally, a few words are added about the provision and arrangement of reading matter High fidelity picture writing could of course be read by nearly everyone with little or no training, but as writing progressed through the succeeding stages described in the foregoing pages reading became more and more specialized Reading Chinese phonograms and ideograms or any of the alphabetic languages without special training is out of the question Lack of training has not been the only barrier to universal reading Reading matter is also required, and up until the invention of the printing press and paper, both of which are comparatively recent accomplishments, only a few could afford books Clay and waxed tablets, shell, stone, ivory, certain soft metals, papyrus, parchment, and vellum were the chief writing materials used, all of which were difficult to prepare All writing on them was done by hand

In the earliest stages of picture writing the characters were arranged with little regard for order There were few conventions In a picture letter, Figure 3, an Indian offers to exchange a buffalo skin, fish-otter, and fisher for a gun and thirty beaver skins [12]

[11] Huey, *op cit*, p 217
[12] From Wundt, after Huey, *op cit*, p 226

As writing tended to become somewhat formalized different cultures adopted different conventions Egyptian scribes arranged their hieroglyphs either in horizontal lines or in vertical columns Some, the Hittites, wrote from left to right and then, on the return, from right to left, the two directions alternating The Easter Islanders are said to have begun reading left to

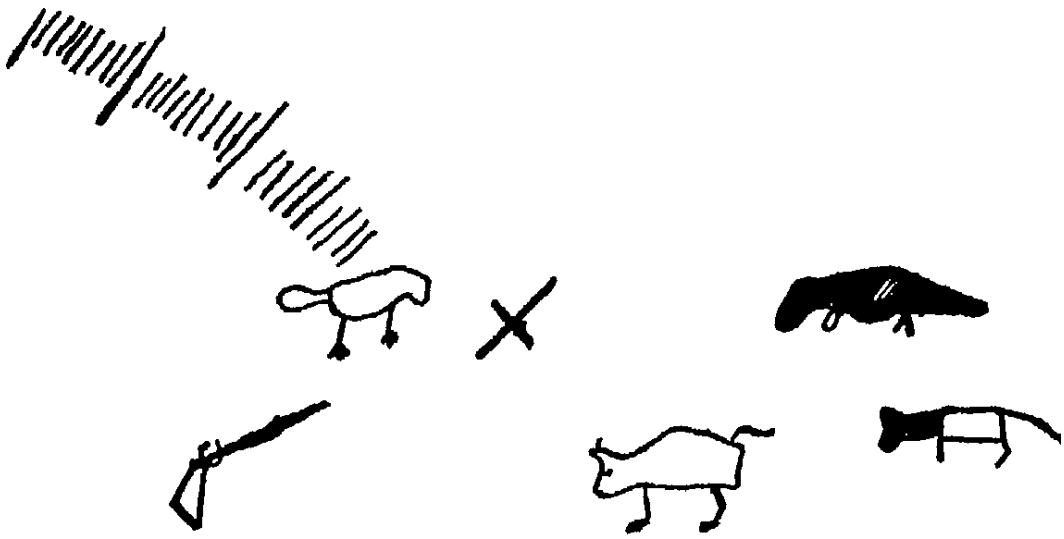


FIG 3 A PICTURE LETTER

right on the bottom line and upon reaching the end of the line to have turned the tablet upside down, reading still from left to right on the second line from the bottom Modern Hebrew is read from right to left and the Chinese read downwardly A variable arrangement presented no special problem to a scribe before the advent of cursive writing In manuscript writing the letters were read in the direction in which they faced The coming of the printing press and movable type resulted in a high degree of standardization in writing and reading

FUNDAMENTAL READING HABITS

Pioneers The first person to report on the saccadic movement of the eyes in reading appears to have been Javal, a Frenchman, and this he did in 1879 Little account was taken of Javal's observations until about 20 years afterwards He suggested that reading occurs only during the pauses, that neither words nor letters are seen clearly during the "jumps"

The fact that the eyes move in a series of quick jerks along a line can be readily verified by observing the reader's eyes in a mirror situated face-upward beside the reading matter While the fact of saccadic movement can be determined in this way, it is difficult to ascertain thereby the exact number of movements per line and impossible to ascertain the duration of the pauses Experimentation requires, therefore, more exact determination Several methods were tried before the finally satisfactory photographic technique was devised

One investigator perfected an electrical instrument whereby eye movement activated a microphone, making it possible to count the sounds — a more accurate procedure than counting the movements themselves In 1891 Ahrens, a German worker, sought to obtain a kymographic drum record of eye movement by means of a bristle pointer attached to a delicate ivory cup adjusted to the cornea of one of the reader's eyes A few years later Huey added to an improved mechanical device an electrical timing unit that proved to be somewhat more satisfactory [13] In 1906 Dearborn published the results of a systematic investigation of eye movements, in which use was made of the Dodge method of photography [14] This method provided a continuous photograph of the horizontal movements of a beam of light reflected off the cornea, as recorded upon a highly sensitive, slowly falling photographic plate [15] Later Schmidt and others at the University of Chicago employed motion picture film instead of a moving photographic plate This procedure has been standard in subsequent investigations of eye movement [16]

[13] E B Huey, "Preliminary Experiments in the Physiology and Psychology of Reading," *American Journal of Psychology*, 1898, Vol 9, pp 575–586

[14] W F Dearborn, "The Psychology of Reading an Experimental Study of the Reading Pauses and Movements of the Eye," *Archives of Philosophy, Psychology, and Scientific Method*, 1906, No 4

[15] The Dodge technique is described in an article by R Dodge and T S Cline, "The Angle Velocity of Eye Movements," *Psychological Review*, 1901, Vol 8, pp 145–157 For a review of the literature on eye-movement apparatus see M A Tinker, "Eye Movements in Reading," *Journal of Educational Research*, 1936, Vol 30, pp 241–277

[16] W A Schmidt, 'An Experimental Study of the Psychology of Reading," *Supplementary Educational Monographs*, 1917, No 2

Scores of investigations of eye movements have been conducted and the principal issues are now fairly well agreed upon Javal's suggestion that reading takes place only when the eyes are at rest has been established Letters and words as distinct forms are not seen during movement of the eyes Knowledge of the rate of movement, the number and duration of the fixation pauses, and of the factors upon which variability in them depends is fairly well rounded out The factual data presented in the following pages on eye movements and their conditions are taken largely from the work done at the University of Chicago, which started about 1917, and that of other later investigators, although the principal facts had been arrived at by Dearborn, as early as 1906

Speed of movement Comparatively little of the time spent in reading a page is taken up in movement By far the greater part of the time is spent with the eyes in fixed positions For nine selections of reading material, ranging from very easy to difficult prose, Tinker found less than 10 per cent of the reading time to be taken up with movement His results, in average for 10 university students, are shown in Table II [17]

TABLE II

MOVEMENT TIME AND PAUSE TIME IN READING

Time in Per Cent	Material B	X	C	D	E	F	G	H	I
Movement	9 6	6 2	6 4	8 1	8 5	7 3	5 3	7 9	6 2
Pause	90 5	93 8	93 6	91 9	91 5	92 7	94 7	92 1	93 8
Ratio	1/9 8	1/15 7	1/15 1	1/11 6	1/11 1	1/13 2	1/18 8	1/11 9	1/15 6

The ratio of movement time to pause time varies somewhat with the complexity of the material and with the purpose or set of the reader The rate of movement itself does not vary materially, but inasmuch as the duration of the pauses does vary with the difficulty of the material and the set of the reader, the proportion of the total reading time taken up in movement like-

[17] M A Tinker, "Time Taken by Eye-movements in Reading," *Journal of Genetic Psychology*, 1936, Vol 48, pp 468–471

wise varies, the two factors in reading time being total movement time and total pause time Consequently, the more difficult the material and the more analytical or studious the set, the smaller is the per cent of reading time required for movement In commenting upon these relationships Woodworth calls attention to the efficiency of the reading process [18] Schmidt found the average movement time, the time taken to move the eyes from one fixation point to another, to be 22σ (22 milliseconds), per movement, and the time required for the return sweep from right to left to average 40σ [19]

Frequency and duration of fixation pauses and their conditions The number of fixations per line and the duration of the fixations, as found by one investigator, are shown for the various grade levels from 1B to college in Table III The reading matter for the first-grade subjects was a 6-line paragraph appropriate to their reading ability The remaining subjects read three short paragraphs, amounting to about a half page of easy matter, within the range of second-grade ability As judged by frequency and duration of pauses, together with the number of regressive movements, "reading maturity" is reached approximately at the fifth grade [20]

It is seen that the average number of fixations per line by the mature subjects, for the reading matter used, second grade, is between 5 and 6 Naturally, the number of fixations per line varies with the length of line The line length in Buswell's investigation was 3½ inches, or 21 *picas* This book is set in 23-*pica* line length The foregoing results are not strictly applicable to line lengths longer or shorter than 21 *picas* The statements currently found in textbooks in education and psychology to the effect that the average high school and college student makes 5 to 6 fixations per line are slightly misleading Textbooks and source material are rarely set in 21-*pica* line length They usually run from 24 to 28 *picas* (from 4 to 4⅔ inches) The statement that 8 to 10 fixations are made per

[18] R S Woodworth, *Experimental Psychology*, p 725 New York Henry Holt and Co , 1938

[19] *Op cit*

[20] G T Buswell, "Fundamental Reading Habits a Study of Their Development," *Supplementary Educational Monographs*, 1922, No 21

TABLE III

MEAN NUMBER OF FIXATIONS AND REGRESSIONS PER 21-PICA LINE AND MEAN DURATION MILLISECONDS (σ)

Grade	N	Fixations	Regression	Duration in σ
1B	9	18 6	5 1	660
1A	12	15 5	4 0	432
2	19	10 7	2 3	364
3	15	8 9	1 8	316
4	15	7 3	1 4	268
5	16	6 9	1 3	252
6	19	7 3	1 6	236
7	8	6 8	1 5	240
F	11	7 2	1 0	244
So	12	5 8	0 7	248
J	19	5 5	0 7	224
Se	12	6 4	0 7	248
Col	13	5 9	0 5	252

First-grade material was read by subjects of Grades 1B and 1A, second-grade material by all others

line by the average mature reader is more in keeping with the facts Anderson, in an article cited presently, used a more general expression, namely the number of fixations in *ems* per fixation [21]

(1) *Oral and silent reading* An important difference is noted as between silent and oral reading Above the first grade Buswell's subjects made approximately 2 fixations per line more in oral than in silent reading, making the average for mature readers between 7 and 8 in a 21-*pica* line The pause time is also significantly longer in oral than in silent reading for all grade levels, the difference being approximately 50σ, per pause, on an average

(2) *Difficulty of material* Another factor known to influ-

[21] *Cf* R Y Walker, "The Eye Movements of Good Readers," *Psychological Monographs,* 1933, Vol 44, Whole No 199, pp 95–117

ence the number of fixations per line is the difficulty of the reading matter Table IV shows the median records of 10 fifth grade pupils in reading paragraphs of successive levels of difficulty, taken from Gray's standardized reading paragraphs These data are taken from the work of Judd and Buswell [22]

TABLE IV

THE RELATION BETWEEN NUMBER OF FIXATIONS PER LINE AND DURATION OF FIXATIONS AND DIFFICULTY OF MATERIAL

Paragraph	Ave No Fixations per Line	Ave Duration in σ	Ave No Words Read per Fixation
4	6 0	236	1 50
6	7 0	244	1 40
8	7 2	248	1 16
10	6 4	248	1 06
12	7 8	276	82

(3) *Influence of set* In another condition Judd and Buswell obtained 8 2 as the average number of fixations per line for 20 subjects when asked to read a selection as they would read an ordinary newspaper item When instructed to read the passage again more carefully and informed that questions would be asked about it, the average number of fixations obtained was 9 3 per line The average fixation time for the first *set* was 237σ, for the second, 250

(4) *Determining factors* It is, of course, obvious that the number of fixations per constant line is inversely proportional to the functional unit of reading The fact that the unit varies with the complexity of the reading matter and with the set of the reader, as well as the fact that it is highly variable within a given individual – sometimes embracing only a fractional part of a single word, at others encompassing two or three words, shows that its size is not determined by the amount that can be seen Moreover, there is independent evidence that sub-

[22] C H Judd and G T Buswell, "Silent Reading a Study of the Various Types," *Supplementary Educational Monographs*, 1922, No 23

jects are capable of perceiving much larger units than those employed in reading, as when groups of words are presented tachistoscopically for an interval too brief to permit eye movement By this method subjects experience no great difficulty in perceiving from a fourth to half a line at a time, when presented as isolated units

We may conclude, then, that the size of the unit is dependent upon the comprehension, not upon the amount that can be seen, and that this varies in some kind of relationship with the other units in the sentence Moreover, variability in length of the pauses made by the same reader, and especially the fact that the time varies systematically with the difficulty of the material and the mental set of the reader, argues that the time is not closely dependent upon the time required of the retina to react to the words Again it is known from independent evidence that the retinal time is only a fraction of the time actually utilized in the fixation pauses

Regressive movements The average number of regressive movements per line made by Buswell's subjects for the various grade levels, except 4 and 6, in silent and in oral reading is shown in Table V By projecting eye-movement and voice

TABLE V

REGRESSIVE MOVEMENTS IN READING

	1B	1A	2	3	5	7	F	So	J	Se	Col
Silent Reading	51	40	23	18	13	15	10	07	07	07	05
Oral Reading	44	31	25	18	14	20	15	15	11	14	12

records synchronously on the same film, in oral reading, Fairbanks was able to show that one important factor in regressive movement is misreading In order to straighten out the sense of a passage the reader goes back to a previous section to correct the error

Mature readers make fewer regressions than do immature readers It cannot be said, however, that good readers do not make regressive movements The number of such movements is likely to be greater when the subject is reading carefully and

analytically than otherwise From the point of view of speed, it is, of course, desirable to make as few regressions as possible, other things being equal They should be made when necessary [28]

Eye movements as cause or symptom It is seen in the foregoing paragraphs that eye movements have a developmental history and that several variables are correlated with eye-movement phenomena Since one cannot read without eye movement nor read any faster than the eyes move, it is obvious that there exists a perfect correlation between speed of reading and total movement time plus total fixation time. It does not follow, however, that speed of reading is limited by the speed of movement and the frequency and duration of the fixation pauses The fact that speed of reading varies with the complexity of the reading matter and with the purpose or set of the reader argues that it is not strictly limited by these eye-movement factors A limiting factor seems to be rate of understanding The question is one of the extent to which rate of reading is conditioned by central factors and by such peripheral factors as eye movements and retinal reactions

It remains a possibility that poor eye-movement habits, through years of practice, become somewhat stereotyped and as a consequence serve as a dampener of reading rate There is no *a priori* reason why special training in eye movements should not be expected to result in some improvement in reading rate There is some experimental literature on this subject, which is examined presently

RATE OF READING

Question of determining rate Rate of reading is much more difficult to determine than is at first apparent It is relatively simple to ascertain the rate at which a person reads a particular passage under a particular set of conditions But there is no one fixed rate at which he reads Particularly, his rate varies with the character of the material and the purpose for

[28] G Fairbanks, "The Relation between Eye-movements and Voice in the Oral Reading of Good and Poor Silent Readers," *Psychological Monographs,* 1937, Vol 48, Whole No 215

which he reads Moreover, the rate at which he reads on a reading test may not be his natural rate There is some reason to believe that most of the figures on rate are too high They are likely to represent the rate at which a pupil *can* read, under the pressure of a test situation, rather than the rate at which he *does* read

The simplicity of the problem of determining the rate of reading a single passage of material is likely to be deceiving There is no good way of controlling the level of understanding The technique of requiring students to show evidence of understanding by answering questions is not entirely satisfactory If one gives credit for wrong answers as well as for right ones, nothing is gained by the technique On the other hand, the "number right" does not give an adequate index of rate, because a wrong answer probably takes as much time as a correct one, possibly more We do not have a great deal of information about the matter of variability in rate within the same individual This paucity of information adds to the difficulty in appraising rate of reading The data that follow should be interpreted in the light of the foregoing limitations

Individual differences in rate of reading The standardization data for rate of reading in the *Iowa Silent Reading Examinations* are given in part in Table VI We may note, for example, that the mean score for the tenth grade pupils is 234 85 words per minute with an S *D* of 50 words per minute [24] The score corresponding to −1 S *D* is thus 184 85 and that corresponding to +1 S *D* is 284 85 Therefore, 16 per cent of this sampling read the selection in question at a rate of 284 85 words or more per minute and 16 per cent read at a rate of 184 85 or less per minute, assuming the distribution to be normal

In 1897 Quantz found that among a selection of 50 University of Wisconsin juniors and seniors the slowest reader averaged 3 5 words per second, and the fastest, 8 8 per second, when reading at normal rate [25] Reading at maximum speed, the rate

[24] A N Jorgensen, "Iowa Silent Reading Examinations," *University of Iowa Studies Studies in Education*, 1927, Vol 4, No 3

[25] J O Quantz, "Problems in the Psychology of Reading," *Psychological Monographs*, 1897, Vol 2, No 1

TABLE VI

NUMBER OF WORDS READ PER MINUTE

Per Cent of Cases Equaling or Exceeding a Given Score	Grade		
	8	10	12
1	327 71	329 65	415 60
10	289 36	305 30	316 60
20	258 50	277 50	294 00
25	251 15	262 50	284 42
30	241 12	251 08	274 88
40	228 67	236 36	256 89
50	211 27	221 27	243 34
60	198 75	209 28	228 00
70	183 59	199 02	216 41
75	179 88	198 86	210 00
80	171 02	188 41	203 58
90	154 72	169 93	188 12
99	109 15	151 03	137 10
N	200	200	280
M	222 08	234 85	260 24
S D	49 7	50 0	51 7

varied from 3 5, the average for the slowest, to 12 2, the average for the fastest Averages for oral reading, normal rate, ranged from 2 6 to 3 9 For a group of 20 graduate students Huey found the slowest average rate to be 2 5 words per second, the fastest, 9 8 The subjects read at their usual rate an interesting novel The averages varied from 3 5 to 13 5 when reading was done at a maximum rate [20]

For a sampling of 664 college freshmen, Booker found the average rate to be 4 03 words per second or 242 per minute, the

[20] It is interesting to note that in both of these reports the initially fast reader is capable, when he exerts himself to the utmost, of increasing his rate by a considerably greater amount than is the initially slow reader It has been found that fast readers are more adaptable to the reading requirements at hand than are slow readers

middle two-thirds falling between 3 and 5 words per second, or 180 and 300 per minute, suggesting an *S D* of about 60 words The poorest read about 120 words per minute, the best, about 420 [27]

On the rate test of the third revision of the Iowa Silent Reading Tests, Elementary, the fourth grade standardization cases at the 50th percentile read 11 sentences per unit of time At the 10th percentile the score stood at 6+ sentences, at the 90th percentile, 20, yielding a ratio of about 3 3 to 1 between the 90th and 10th percentiles [28]

Variability in rate Buswell and Judd, in the investigation referred to previously, found the number and duration of the fixation pauses to be greater on difficult than on easy reading matter [29] Dearborn obtained a similar result He concluded that "one who reads rapidly in a given style and class of subject matter will read somewhat proportionally faster than a slow reader, whatever, within certain recognized limits, the nature of the style and subject matter" Anderson compared eye-movement measurements of good and poor readers (college students) on reading material of three different levels of difficulty (I, primer, II, moderately difficult collegiate text, and III, very difficult collegiate text) [30] The results are shown in Table VII The poor readers, 50 in number, were taken from the lowest quarter in reading proficiency as determined by freshmen entrance tests

Anderson's data suggest that good readers are more adaptable than poor readers His group of poor readers tended more nearly to maintain a constant rate on the three selections than did the fast readers Henderson found some evidence that good readers were also somewhat more adaptable than the poor ones That is, there was a greater difference between the rate

[27] I A Booker, "The Measurement and Improvement of Silent Reading among College Freshmen," *Doctor's Dissertation* University of Chicago, 1932

[28] Data supplied by H A Greene

[29] *Op cit*

[30] I H Anderson, "Studies in the Eye-movements of Good and Poor Readers," *Psychological Monographs*, 1937, Vol 48, Whole No 215, pp 1–35

scores on the easy and the difficult selections in the case of the good (not the fast) readers than in the case of the poor (not the slow) readers

Adaptability is one sign of reading efficiency Perhaps we may agree that adaptability is, and should be, one of the objectives in teaching reading

TABLE VII

RELATION OF EYE-MOVEMENTS TO DIFFICULTY OF MATERIAL FOR UNSELECTED AND POOR READERS

	Primer		Moderately Difficult		Very Difficult	
Measure	Good	Poor	Good	Poor	Good	Poor
Duration Fixations	246	295	255	304	277	316
Size Fixations (in *ems*)	3 40	2 66	2 92	2 68	2 66	2 60
Regressions (per line)	44	1 01	70	1 04	92	1 28
Reading Rate (in *ems* per min)	758 2	497 4	690 9	489 8	558 1	454 3

Question of relative rate There is no doubt that the rate of reading varies considerably with variation in material, purpose, and other conditions Incidentally, the notion that "there are a number of specific rates" is probably as objectionable as the notion of one specific rate Differences in materials and conditions vary continuously, not by discrete and widely separable amounts There is no fixed rate for reading fiction or factual prose or poetry There simply are not any specific rates There remains the question of relative rate Do persons who read one selection fast, as Dearborn suggests, read other selections proportionately fast? The experimental data warrant the conclusion that they *tend* to do so Thus we may speak of a pupil's being a fast, average, or slow reader, moderately fast or slow, and so on

Did pupils always maintain their relative positions, correlations between various rate scores should be perfect within the limits of reliability of the scores When the conditions are

highly similar, the correlations between rate scores approach the reliability of scores, when the conditions are quite dissimilar, the correlations are a bit lower Thus Bond obtained an average correlation of 65 between rate of reading various highly similar pairs of material, reading time being three minutes per selection An average correlation of 57 was obtained between paired selections of 'partially similar" materials, and an average correlation of 45 between various pairs of material of different content [31]

By a special handling of data, which we cannot here describe, Blommers obtained a correlation ratio of 68 between rates of reading several selections (a maximum of 20) of different content and of widely different difficulty The reliability of the combined selections was found to be 81 Thus it would seem that Dearborn's suggestion has been very largely substantiated [32]

RATE AND COMPREHENSION

The pioneer work of Romanes, Quantz, Huey, Dearborn, and others gave evidence of differences in rate of reading amounting to 3 or 4 to 1 between the slowest and fastest readers of fairly well-selected groups — high school and college students Differences considerably greater than these probably prevail in the elementary school, as Henderson's data indicate

All subsequent work has served to corroborate the earlier findings with respect to individual differences in reading rate We may now inquire into the experimental facts respecting the relationship between rate and comprehension Does the slow reader in general learn more — comprehend more — of what he reads than does the fast reader, thereby effecting a compensation for his slowness? This question is probably to be answered in the negative, except when test intelligence is held constant Unless he learns a great deal more per reading he certainly learns less per unit of time The prevailing opinion in educa-

[31] E A Bond, "Tenth-grade Abilities and Achievements," *Teachers College, Columbia University, Contributions to Education*, No 813, 1940

[32] P J Blommers, "Rate of Comprehension of Reading Its Measurement and Its Relation to Comprehension," *Journal of Educational Psychology*, 1944, Vol 35, pp 449–472

tional psychology has been that there is a positive and moderately high correlation, of from 40 to 50, between rate and comprehension Thus, Judd states that "good readers are usually not slow and poor readers are usually not fast" This conclusion, if correct, would place slow readers under a double handicap

W S Gray reports the following results obtained for 1,831 public school pupils [33]

Description	Per Cent
Rapid speed — good quality	14
Medium speed — good quality	11
Slow speed — good quality	8
Rapid speed — medium quality	12
Medium speed — medium quality	11
Slow speed — medium quality	10
Rapid speed — poor quality	8
Medium speed — poor quality	11
Slow speed — poor quality	15

Some correlations between reading rate scores and reading comprehension scores, as obtained by Eurich, are presented in Table VIII The data were obtained on small groups of university students [34] Bond obtained a coefficient of 58 between combined comprehension scores (four tests) and combined rate scores [35]

A wholly satisfactory rationale of this problem has not been achieved The question at issue is whether those who read fast gain more, the same, or not so much, per reading, as those who read slowly The method of correlating scores earned on a

[33] W S Gray, "Studies of Elementary School Reading through Standardized Tests," *Supplementary Educational Monographs*, 1917, No 1

[34] A C Eurich, "The Relation of Speed of Reading to Comprehension," *School and Society*, 1930, Vol 32, pp 404–406

[35] *Cf* V L Anderson and M A Tinker, "The Speed Factor in Reading Performance," *Journal of Educational Psychology*, 1936, Vol 27, pp 621–624 M E Haggerty, 'The Ability to Read Its Measurement and Some Factors Conditioning It," *University of Indiana Studies*, 1917, No 34 M A Tinker, "The Relation of Speed to Comprehension in Reading," *School and Society*, 1932, Vol 36, pp 158–160

TABLE VIII

CORRELATION BETWEEN RATE OF READING SCORES AND COMPREHENSION SCORES

Speed Tests	Minn Reading Examination for College Students	Monroe (Comprehension)
Minn Speed of Reading Test A	47 ± 06	
Chapman-Cook Speed of Reading Test A	49 ± 06	
B	31 ± 07	43 ± 07 (Form 1)
Monroe (Speed) (Form 2)		40 ± 07 (Form 2)

speed of reading test with those earned on a reading comprehension test, the method customarily used, produces in theory just the result wanted In practice it has not proved to be very satisfactory, owing to the fact that use has been made of standardized tests of reading comprehension – tests which themselves are speed tests In other words, the method has yielded results that are to some unknown extent implicated in the method [86]

The so-called comprehension score is a score earned on the comprehension section of a standardized reading test The score is the number of items answered correctly, or the number right minus the number wrong, within a prescribed time limit Obviously the speed of work – reading the text, reading the questions, verifying the answers, and marking the responses – is an important factor in determining the score earned in standard time Thus the comprehension score may be in large measure a speed score It is conceivable that on some of the tests

[86] J B Stroud, "A Critical Note on Reading," *Psychological Bulletin*, 1942, Vol 39, pp 173–178

the comprehension score is as good a rate score as the rate score itself In fact, the "rate of comprehension score," as used by Flanagan, is the number of items answered correctly, within a specified time limit, minus a correction for guessing, which corresponds to the usual procedure for determining a comprehension score [37]

Flanagan's most unique contribution is his "level of comprehension score" The test described in the article here cited consists of four scales of 20 items each The level of comprehension score is the average number of items answered correctly on the scales completed within standard time Thus, 20 is the maximum score, whereas 80 is the maximum rate of comprehension score These two scores have some interesting possibilities for diagnostic work in reading, but for purposes of determining the relationship between rate and comprehension they have some serious limitations, owing to the fact that comprehension is common to both scores, just as rate is common to both scores in the conventional procedure [38] Flanagan reports a correlation of 77 between the two scores However he obtained a correlation of only 17 between level of comprehension scores and rate of reading as determined by the last item attempted in standard time The latter procedure is perhaps the best approach that has been made to the problem at hand — the relationship between speed of reading and comprehension [39]

Something is to be said in favor of a method employed by Abell [40] in 1894 and by King [41] in 1916, namely that of ascertaining the relationship between rate scores, as determined by time

[37] J C Flanagan, "A New Type of Reading Test for Secondary School and College Students Which Provides Separate Scores for Speed of Comprehension and Level of Comprehension," *Official Report of the American Educational Research Association,* 1938, pp 195–199

[38] *Op cit*

[39] J C Flanagan, "A Study of the Effect on Comprehension of Varying Speeds of Reading," *Official Report of the American Educational Research Association,* 1939, pp 47–50

[40] A Abell, "Rapid Reading Advantages and Methods," *Educational Review,* 1894, Vol 8, pp 283–286

[41] I King, "A Comparison of Slow and Rapid Readers," *School and Society,* 1916, Vol 4, pp 830–834

required by various students to read a selection, and scores earned on a test about the selection taken immediately after the reading By allowing unlimited time for taking the test the speed factor can be eliminated from the score The crux of the problem is the relationship between rate of reading and the knowledge and understanding gained from reading This procedure has been criticized on the ground that the obtained score is a memory score rather than a comprehension score This criticism does not seem to be crucial The association between learning and retention is much closer than the chapter headings in textbooks are likely to suggest Any measure of learning is to some extent a measure of retention, and except for retention learning would be impossible Moreover, it is difficult to attach any value to comprehension in reading except as it eventuates in the ability to make a better response afterward There is probably no reason to doubt that the pupil who has the best understanding of what he reads, hears, or otherwise apprehends can give the most intelligent account of it afterward In any situation that involves understanding, that understanding can be measured a moment later There are no inherent difficulties in the measuring of understanding by a learning test Those elements, such as places and dates, that do not provide good tests of understanding in a learning test likewise do not provide good tests of understanding in the typical reading test There seems to be no point in distinguishing between a good reader and a good learner when reading is the medium of learning

The writer has attacked the problem at hand by using the method just described, together with a new method of determining reading rate For the latter purpose a piece of exposure apparatus was designed and constructed, the chief feature of which was a continuous moving screen that exposed approximately three lines at any one moment The reading matter was stationary The screen was driven by a friction clutch activated by a ten-inch disc driven by a synchronous motor The speed of the screen was readily adjusted by the subject by changing the position of the clutch on the disc He was instructed to make such adjustments as required in order to permit a rate at which he "liked to read" Accordingly several practice

trials were allowed on material similar to that to be read in the experiment and under the conditions of the experiment When this rate was determined the subject was not allowed to make any further change during the reading of the first experimental selection If, after he had read the first selection and taken the test pertaining to it, he wished to make further adjustment, he was allowed to do so Thereafter no further change was permitted Two additional selections were read and appropriate tests covering the content of the material administered after the reading of each It seemed likely that this procedure would make some approximation toward yielding a normal rate score, although it introduces an element of artificiality, as does any experimental situation The total number of words read was 2162 and the total number of test items responded to was 55, all multiple choice A correlation of 16 was obtained between rate in words per minute and learning scores [42]

In a group experiment the writer administered two sections of the reading comprehension test of the *Iowa Every Pupil Tests of Basic Skills* to 288 pupils in Grades 5 to 8 The rate score was the time required to read the selections The test items used originally in obtaining the comprehension score were altered in some instances to make them better meet the requirements of a learning test The pupils were instructed to read as they normally did when they were studying their lessons After the students began to read, the time was written on the board every 10 seconds until all had finished reading Each pupil entered on his paper the numbers appearing on the board when he finished reading This became his time score As soon as this score was entered by the pupil, he put the reading material aside and proceeded to answer the test questions He was allowed unlimited time Correlations obtained between reading rate and learning scores, for the four grades, are 06, 02, 12, and 02 Otis intelligence tests were also administered to the pupils The coefficients between rate and learning scores, with

[42] J B Stroud and M C Henderson, "Rate of Reading and Learning by Reading," *Journal of Educational Psychology*, 1943, Vol 34, pp 193–205

test intelligence partialed out, were negative, but low, being about — 25 [43]

Henderson administered four different reading selections, and a learning test appropriate to each, to a group of 603 fifth grade pupils Two of the selections were purportedly of fifth-grade difficulty, one of second-grade and one of ninth-grade difficulty Correlations between reading rate and learning scores were + 03, — 02, — 05, and + 05 [44]

While the customary procedure employed in studying the relationship between rate and comprehension is indefensible, there is more than one defensible method The writer has defended the procedure just described as being one such method That employed by Flanagan, wherein level of comprehension scores were correlated with rate as determined by the last item attempted in standard time, is another The results of these two methods are in substantial agreement It is not safe, however, to generalize from these conditions to all others Blommers has obtained a somewhat higher correlation, 30, between rate and comprehension by a different procedure The test consisted of 20 paragraphs each accompanied by reading instructions for purposes of giving the reader the right set, and a question designed to test the reader's understanding of the thought of the paragraph This test is in every respect a power test The pupils were given unlimited time The number of exercises completed depended upon the pupil's ability The exercises varied in difficulty from easy to very difficult Each of the 20 sub-tests was timed separately, time representing the total time required to complete each such test, *i e*, to read the directions, the paragraph, the test item, and mark the answer In order to make sure that the reading was done with understanding, only those sub-tests that were responded to correctly were considered in the final score of a pupil The raw time scores were converted into standard scores and the means were correlated with the number of sub-tests passed [45]

In the procedure used by Blommers, thinking time, as the questions are weighed, becomes a part of reading time This procedure is entirely legitimate, although it is less natural than

[43] *Ibid* [44] *Ibid* [45] *Op cit*

that used by the writer A reader normally proceeds at a fairly uniform pace, at least he does not stop at the end of each paragraph to ponder questions In other words, in normal situations the quality of reading is not strictly controlled In a power test situation mental ability makes for speed of reaction and the same mental ability makes possible the answering of many difficult items that the less able student cannot answer at all In view of these considerations it is surprising that the correlation obtained by Blommers (+ 30) was not higher Blommers' method has the important advantage of making sure that the material is read with at least a standard degree of understanding

While the foregoing data indicate that rate and comprehension are not at all closely related, it may well be that there is a closer relationship than has been detected by the highly restricted character of the reading selections used in the experiments If we assume that facile reading leads to more reading — that rate is related to amount of reading done, it is reasonable to suppose that there is some over-all relationship between rate and comprehension, since quality of reading must surely be related to the reader's background and fund of information and since this is probably related to amount of reading

Effect of inducing variation in rate of reading A problem related to the foregoing is the effect upon comprehension, or learning, of varying the rate of reading by inducing subjects to read at controlled rates Work of King,[46] Greene,[47] and Flanagan [48] indicates that rapid reading is less effective than moderate and slow reading rates Greene's results indicate that the important thing is the total amount of time spent According to his results one slow reading is as effective as two or more rapid readings, when the total time spent in reading is the same Thus, there may be some reason to question the oft repeated recommendation, which in so far as the writer is aware has not

[46] I King, "A Comparison of the Efficiency of Slow and Rapid Readers," *School and Society*, 1917, Vol 6, pp 203–204

[47] E B Greene, "Effectiveness of Various Rates of Silent Reading of College Students," *Journal of Applied Psychology*, 1931, Vol 15, pp 214–227

[48] *Op cit*

been experimentally substantiated, that students should read a lesson once quickly, as in skimming, and again more slowly and carefully

Flanagan found the effect of increased rate of reading on comprehension to be approximately equal for students achieving different levels of comprehension at the slow rate That is, the pupils in the upper, middle, and lower thirds in comprehension scores, earned when reading at a slow rate, were adversely affected to about the same degree by the increased rates However, in most of the work on controlled rate there is an indication that the loss in comprehension is not proportional to the time saved by a faster rate Thus, while students learn more per reading when reading at a slow rather than at a rapid rate, they may learn somewhat less per unit of time

READING DISABILITIES

Reading disabilities and the allied subject, corrective instruction, have become a major division of the subject matter of education and of educational psychology Both have been the object of a vast amount of research, the literature has become voluminous, quite too much so to be treated in any detail in this text We shall, however, point out some of the principal lines of investigation A small percentage of those who are deficient in reading are said to have *special disabilities* in that their ability to read is significantly below that which would be predicted from their other abilities These pupils are frequently referred to in clinical practice as *reading cases* The clinician prefers to work with such cases because of the probability of effecting marked improvement if the cause of the special deficiency can be discovered and an effective program of training specific thereto devised The number of these special disabilities is comparatively small when put in relation with all those who are sub-standard in reading

Movement and fixation time We have seen that, mechanically, reading time is taken up with eye movement and pauses The total movement time plus the total fixation time equals the time of reading Obviously, slow readers have less efficient mechanics than do fast readers However, it is debatable as to

whether or not faulty mechanics may be regarded as a *cause* of slow reading They may be little more than symptomatic of deficiencies in assimilation

Whipple's statement on this subject, made in 1913, may stand as an expression of the present-day point of view "I do not myself feel sure that these peculiarities of eye movement in fast readers are in any way an explanation of their superior speed, but am inclined to consider them as mostly an expression or symptom of higher speed of assimilation" [49] Dewey came to the same conclusion in connection with study of reading deficiencies in American history [50] On the other hand, in view of the proclivity toward bad habits, it is a distinct possibility, according to the writer's lights, that faulty mechanics may be in many cases a *cause* of poor reading

Association time Reading deficiencies are of two kinds, chiefly, those involving speed and those involving quality The discussion of association time as well as that of the two following topics, speed of perceptual analysis and perceptual span, pertains to deficiencies in speed Traxler obtained correlations of approximately 50 between rate of reading and speed of association, particularly free association and the naming of antonyms [51] However, Bear and Odbert obtained coefficients considerably smaller in magnitude, namely about 20, for two groups ($N = 47$ and $N = 38$) of college freshmen enrolled in a course in corrective reading and study methods These groups were obviously rather homogeneous, although the authors point out that some of the subjects were average or better in speed [52]

Perceptual factors Since reading is a perceptual process, and perhaps our most complicated and highly organized per-

[49] G M Whipple, "The Eye-movements in Reading," *Education*, 1913, Vol. 33, pp 552–558

[50] J C Dewey, "A Case Study of Reading Comprehension Difficulties in American History," *Doctor's Dissertation* State University of Iowa, 1931

[51] E A Traxler, "The Relation between Rate of Reading and Speed of Association," *Journal of Educational Psychology*, 1934, Vol 25, pp 357–365

[52] R M Bear and H S Odbert, "Experimental Studies of the Relation between Rate of Reading and Speed of Association," *Journal of Psychology*, 1940, Vol 10, pp. 141–147

ceptual process, there are, naturally, perceptual factors in reading disabilities The question this heading poses is whether or not rate of reading is associated with rate of perceptual analysis in general, such as to justify the inference that rate of reading is conditioned by rate of perceiving

If it could be established that there is a general factor of rate of perception then we would have strong presumptive evidence in support of an affirmative answer A positive correlation between rate of reading and rate of perceptual analysis in situations other than reading would likewise suggest an affirmative answer Data at hand, although not entirely conclusive, support both these conditions In view of the complicated nature of reading, we should not expect to find, in any event, that its rate is determined entirely by rate of perception, but should it prove to be a significant factor it could not be ignored (or should be ignored no longer) Gates, it will be recalled, obtained only slight evidence of the existence of a general rate of perception as determined by intercorrelations between his various perceptual tests, and, moreover, found moderately high correlations between reading scores — composite of rate, comprehension, vocabulary, etc — and rate of perception only in the case of perception of word forms [53]

Sister Mary has investigated the relationship between reading and spelling, on the one hand, and visual perception, on the other, using the following three kinds of tests of perception One test was made up of items of this variety **backable ableback askbacko abackset** , in which the subject was to write in the blank space the word common to or contained in each of the four nonsense words Four tests, — one of words, one of digits, one of letters, and one of drawings — of the following type were used

decide	decide	deride	beside	decode
cfgru	cfyru	cfgru	afgru	cfgrn

[53] A I Gates "The Psychology of Reading and Spelling," *Teachers College, Columbia University, Contributions to Education,* No 129, 1922

The subject's task was to check one of the four characters in each row that matched the one in the box There were also four tests likewise consisting of words, digits, letters, and drawings, presented in pairs All pairs were similar, some were identical, others differed in some respect The subject's task was

TABLE IX

CORRELATIONS BETWEEN SCORES ON VISUAL PERCEPTION TESTS AND SCORES ON READING AND SPELLING TESTS

Perception Test	r_{11}	Reading Tests			Spelling Tests		Intelligence
		1	2	3	4	5	6
1 (common word)	57	62	52	61	56	52	38
2 (words, identification)	83	74	63	81	74	73	33
3 (digits, ")	74	58	47	54	41	27	21
4 (letters, ")	65	75	66	81	71	42	35
5 (drawings, ")	63	11	01	25	03	03	08
6 (words, paired)	77	68	63	77	69	74	33
7 (digits, ")	57	44	25	35	40	21	21
8 (letters, ")	65	30	31	56	33	34	18
9 (drawings, ")	32	14	25	35	34	36	33

Legend r_{11} = reliability coefficient, 1, Sangren-woody, 2, Stanford Achievement (Reading Examination), 3, Gates, 4, Morrison-McCall, 5, Stanford Achievement (Spelling Scale), and 6, Dearborn Group Test of Intelligence, Series II, General Examinations *C* and *D* Coefficients are corrected for attenuation

to indicate whether the pairs were the same or different The median of the reliability coefficients of these tests was 65 for Grade 4 and 53 for Grade 5 These coefficients may be regarded as very satisfactory for a single grade level The results for Grade 4 are shown in Table IX [54]

The writer has recently administered certain of Sister Mary's tests to several hundred pupils in the intermediate grades and correlated the scores with Chapman-Cook rate of reading scores The results are in agreement with her findings [55]

[54] Sister Mary (of the Visitation) Riley, "Visual Perception in Reading and Spelling a Statistical Analysis," *Doctor's Dissertation* Catholic University of America, 1929

[55] *Cf* A I Gates, "A Study of the Role of Visual Perception, Intelligence, and Certain Associative Processes in Reading and Spelling," *Journal of Educational Psychology*, 1926, Vol 17, pp 433–445

The foregoing results, should they be substantiated, would have considerable significance Everyday observation suggests that some persons are quick in their mental reactions and that others are more deliberate It is thinkable, in fact seems plausible, that there are considerable individual differences in aptitude for speed of reading There is no *a priori* reason why everyone should be able to read fast, although every intelligent person should be able to read well It is possible that one of the factors contributing to differences in rate of reading is differences in the rate of perception (and of other mental processes involved in reading)

Two other investigations are mentioned, one by Rizzo [56] on visual and auditory memory span and one by Litterer [57] on visual memory span Both obtained low positive correlations between the measures used and reading ability

Reversals and laterality Another factor associated with reading deficiency is error in reading the symbols, a condition that Orton has named *strephosymbolia*, meaning twisted symbols — a common form of which is the making of reversals, as in the confusion between *was* and *saw*, *on* and *no*, *b* and *d*, and so on It is agreed that poor readers are more prone to this kind of error than are good readers In an investigation of 100 poor readers, Grades 3 to 6 inclusive, Witty and Kopel administered the Betts Test of Oculomotor and Perceptual Habits and compared the performance of these pupils with that of a sampling of slightly better than average readers in the same grades A total of 108 symbols — letters, numbers, and words — was presented The average number of errors made by the poor reading group was 17 2, by the good reading group, 2 4 The average number of reversals was 6 2 and 1 1, respectively [58]

Laterality or sidedness refers to the preponderant use of one

[56] N D Rizzo, "Studies in Visual and Auditory Memory Span with Special Reference to Reading Disability," *Journal of Experimental Education*, 1939, Vol 8, pp 208–244

[57] O F Litterer, "An Experimental Study of Visual Apprehension in Reading," *Journal of Applied Psychology*, 1938, Vol 17, pp 266–276

[58] P A Witty and D Kopel, "Factors Associated with the Etiology of Reading Disability," *Journal of Educational Research*, 1936, Vol 29, pp 449–459

member of the body in preference to that of the other member of a bilaterally symmetrical pair Handedness and eyedness have been investigated more extensively than any of the other phenomena Laterality has come to be associated with discussions of errors in reading by virtue of a putative connection between this phenomenon and hemisphere dominance, of which sidedness is a symptom Mixed laterality — right-handedness and left-eyedness and vice versa — and imperfect laterality — lack of a decided preference — are said to reflect imperfect hemisphere dominance Hemisphere dominance is a hypothesis put forward to explain laterality and certain disabilities in reading, speaking, and writing allegedly associated therewith Various theories have been advanced to explain the connection between reading errors and lack of dominance [59]

Inasmuch as the empirical evidence stands against there being any association between reading errors and laterality, there is no good reason to go into the theories of how imperfect dominance, of which mixed and imperfect laterality are alleged to be symptomatic, is productive of such errors In their investigation just cited Witty and Kopel failed to find any relationship between laterality and reading disabilities Their good readers and their poor readers were quite similar with respect to laterality data, as is seen in Table X

These findings corroborate previous investigations, for example, those of Kirk,[60] and Woody and Phillips [61] [62]

Visual aberration In clinical practice the eyes of the poor reader are examined as a routine procedure While this is in

[59] S T Orton, "Word-blindness in School Children," *Archives of Neurology and Psychiatry*, 1925, Vol 14, pp 581–615 S T Orton, *Reading, Writing, and Speech Problems in Children* New York W W Norton and Co , 1937 W F Dearborn, "The Nature of Special Abilities and Disabilities," *School and Society*, 1930, Vol 31, pp 632–636

[60] S A Kirk, "A Study of the Relation of Ocular and Manual Preference to Mirror Reading," *Journal of Genetic Psychology*, 1934, Vol 44, pp 192–205

[61] C Woody and A J Phillips, "The Effects of Handedness on Reversals in Reading," *Journal of Educational Research*, 1934, Vol 27, pp 651–662

[62] See also P A Witty and D Kopel, "Sinistral and Mixed Manual-ocular Behavior in Reading Disability," *Journal of Educational Psychology*, 1936, Vol 27, pp 119–134

every respect justifiable, it is not to be understood that deficiencies in vision, at least in the ordinary sense, are importantly associated with reading disability That is, if the seeing apparatus of every reading case in the nation were put in good order, no more than a very small dent would have been made in the number of reading deficiencies in our schools Monroe,[63]

TABLE X

EYE AND HAND PREFERENCES, IN PERCENTAGES, FOR POOR AND NORMAL READERS

Reading Ability	R	RL	A	LR	L	N
			Handedness			
Poor	75	8	3	8	6	100
Good	70	15	5	3	8	73
			Eyedness			
Poor	52	8	5	5	30	100
Good	54	13	3	9	22	78

R = Right in 86 4 to 100 per cent of the tests
RL = Right with left tendencies
A = Ambidextrous, right preference in from 59 1 to 45 5 per cent of the tests
LR = Left with right preferences
L = Left in 86 3 to 100 per cent of the tests

Witty and Kopel, and others have failed to find any very significant differences in visual acuity between poor and normal readers These findings accord with the more general result that improvement in school work is not typically associated with the correction of visual defects, as is seen, for example, in an investigation by Chambers [64]

Muscular imbalance Muscular imbalance has received considerable attention for a decade or more As noted in the pre-

[63] M Monroe, *Children Who Cannot Read* Chicago University of Chicago Press, 1932

[64] R L Chambers, "Changes in Achievement Following the Removal of Certain Physical Defects in Elementary School Pupils," *Doctor's Thesis* University of Pennsylvania, 1931

vious chapter, the two eyes normally move co-ordinately, a condition that insures the casting of the two images upon corresponding retinal points When this happens, unitary vision results, when the images fall upon non-corresponding retinal points, doubling results Normally there is a certain amount of disparity between the images of tridimensional objects, an amount which varies inversely with the distance of the fixated object Ordinarily the amount of disparity is not so great as to prevent unitary vision For plane objects, as in the words encountered in reading, there is no disparity under ideal circumstances However, in some individuals, owing to muscular imbalance, there may occur sufficient disparity to prevent the securing of clear images In 1932 Eames reported that the incidence of muscular imbalance in his reading disability cases (N = 114) was significantly higher than in his unselected cases (N = 143) [65] Similar findings have been reported subsequently by Betts,[66] Selzer,[67] and Witty and Kopel [68]

The latter found that of 100 poor readers 29 gave evidence of slow fusion and that in their group of good readers of the same age and grade level only one demonstrated the difficulty They conclude, however, against there being any causal relationship between reading disability and fusional difficulties, since those of the poor readers who gave evidence of the difficulty read no worse than those of the poor readers who were free from it This conclusion does not quite ring true The poor readers were poor by selection, being the lowest 5 per cent in 2000 pupils With such rigid selection there was comparatively little opportunity for those having fusional difficulties to differ from those not having them

Test intelligence In 1922 Gates wrote "Among unselected children backwardness in reading will probably be more

[65] T H Eames, "A Comparison of Ocular Characteristics of Unselected and Reading Disability Groups," *Journal of Educational Research*, 1932, Vol 25, pp 211–215

[66] E A Betts, "Reading Disability Correlates," *Education*, 1935, Vol 56, pp 18–24

[67] C A Selzer, "Lateral Dominance and Visual Fusion," *Harvard Monographs in Education*, 1933, No 12

[68] *Op cit*

frequently associated with low general mental ability than with any other single cause" [69] In 1932 Tinker, in summarizing the data on causes of reading deficiencies, states that "the most important determinant of reading ability is, without doubt, general intelligence" These statements are entirely endorsable today [70]

When *C A* is held constant, reading proficiency may be correlated with almost any kind of intelligence test score, such as *M A*, *I Q*, or raw scores When *C A* is variable it is not legitimate to correlate *I Q* with reading scores for purposes of determining the relationship between test intelligence and reading proficiency Moreover, the magnitude of the coefficients obtained will vary with the range of talent For a grade range of from 2 to 8 one might expect to obtain a correlation of 80 or more between *M A* and scores on a good reading test, whereas for any one of these grades alone it would be much lower Ordinarily the coefficients vary somewhat with the amount of reading involved in the intelligence test For example, a good slow reader is handicapped on most group intelligence tests, although it is improbable that a pupil will make a high score on a typical group test merely because he is a fast reader

A few samples are here given Gates obtained an average coefficient (computed separately for each grade from 3 to 8) of 49 between Stanford-Binet *M A*'s and composite reading scores, and an average coefficient of 71 between the same reading scores, obtained on the same pupils, and composite scores of several verbal group intelligence tests, and an average coefficient of 20 between the reading scores and non-verbal group intelligence test scores [71] For a group of college sophomores Litterer obtained a median coefficient of about 52 between two group intelligence tests and various reading tests The median intercorrelation between the various reading tests is likewise

[69] A I Gates, "The Psychology of Reading and Spelling with Special Reference to Disability," *Teachers College, Columbia University, Contributions to Education*, No 129 New York Columbia University, 1922

[70] M A Tinker, "Diagnostic and Remedial Reading I," *The Elementary School Journal*, 1932, Vol 33, pp 293–306 (II, pp 346–357)

[71] *Op cit*

about 52 [72] Bond reports a correlation of 73 between New Stanford-Binet *I Q*'s and reading comprehension (composite of four tests) in the case of 200 tenth grade pupils This group is characterized as typical [73] It will be recalled that Gates' subjects were rather highly selected with respect to test intelligence, as were also Litterer's

There is a vast literature upon this subject The correlations probably average around 60 There are, as is to be expected from coefficients of this magnitude, pupils of high test intelligence who read poorly, although they are decidedly in the minority The reverse is found very infrequently, that is, there are very few good readers among pupils of low test intelligence Durrell found that of 1130 children who had received the Stanford-Binet intelligence test approximately 39 per cent were retarded a year or more in reading, as reckoned by three reading tests, at the end of the sixth year in school [74] Of these retarded readers 327, or 73 per cent, had obtained *I Q*'s of less than 90 Thus, of this group of poor readers, as defined, about one in four had earned *I Q*'s of 90 or above There is no great prospect of making good readers out of dull children, although, certainly, we should do as much for them as we can There are, however, quite a few students whose reading efficiency is sufficiently below their general mental ability as to require special attention Durrell found that 15 2 per cent of his group were reading at a year or more below standard for their *M A*'s, and three per cent, two years or more below Durrell and Sullivan found that of 6000 pupils, Grades 2 to 6, 14 6 per cent were reading at a level one year or more below their listening comprehension, and 3 4 per cent, two years or more below [75]

Emotional factors Those who have worked closely with clinical cases in reading report with great regularity the pres-

[72] *Op cit*

[73] *Op cit*

[74] D D Durrell, *Improvement of Basic Reading Abilities*, p 278 Yonkers-on-Hudson, New York World Book Co , 1940

[75] D D Durrell and H B Sullivan, *Durrell-Sullivan Reading Capacity and Achievement Tests Manual* Yonkers-on-Hudson, New York World Book Co , 1937

ence of emotional disturbances As Fernald points out, the cause and effect relationship is not easy to determine [76] Apparently either may be cause or effect In one case a pupil may not progress in reading because of emotional disturbances that have their origin elsewhere, in which case it may be deemed advisable to attempt to secure better emotional adjustment as a condition to teaching reading In another instance frustration occasioned by failure in reading may lead to emotional disturbance, in which case, learning to read would tend to mitigate the emotion But failure in reading and emotional disturbance may be both cause and effect in the same pupil, as when failure in reading occasions emotional excesses which, when occasioned, interfere with attempts to overcome the deficiency in reading In this event it seems desirable, and in extreme cases almost necessary, to effect some reduction in emotion before reading instruction can go forward

Fernald's case work shows further that the emotional effects of frustration in reading may well extend to subjects like arithmetic and art that do not depend so much upon reading as some of the other subjects Thus severe reading deficiencies may handicap a pupil not only in the more academic sense that he must acquire much of his information through reading, but also in the sense that unfavorable emotional reactions engendered by failure in reading may extend to other subjects

In all instruction in reading the pupil should start at a point at which he is capable of succeeding In the case of the older pupil seriously retarded in reading there may intrude another factor of some emotional significance Since the severely retarded pupil can succeed only with the simplest words and sentences — material written for pupils very much younger — he may find the content uninteresting and actually embarrassing It would be a great service to have simply written materials that treat subjects of greater interest to the older retarded pupils

Deficiencies in utilization The foregoing treats what may be called, broadly, the psychology of reading — the processes

[76] G M Fernald, *Remedial Techniques in Basic School Subjects*, Chapter II New York McGraw-Hill Book Co , Inc , 1943

and conditions of reading Within the last few years, in particular, educators have gone considerably farther afield, as may be seen in the recent literature on reading[77] The educator is particularly interested in the utilization of reading in mental development He is not content merely to teach pupils to read, but insists that pupils be taught the wisest and best utilization of reading skill It is quite conceivable that there are good readers who do comparatively little reading for enjoyment, or who know little about how to find information or use the library, or who have not developed habits of critical reflection As teachers have come to realize that the wise utilization of reading ability does not necessarily result from the acquisition of this ability they have incorporated various types of utilization in their teaching objectives Indeed we now have series of readers which feature one or another of these objectives The Horn series may be said to feature the study skills, the Witty series, recreation or amusement, and so on Thus we may call the inability to organize thought, to draw useful conclusions and inferences, to make critical analyses — in short to learn from books — and to appreciate good books a deficiency in the utilization of reading skill, provided, of course, the basic reading habits have been acquired already

There is such a thing as wise use of whatever facility in reading one possesses As seen previously, pupils differ one from another enormously, almost alarmingly, in facility in reading, even at the secondary and collegiate levels Authorities have recognized these differences for a number of years, and have instituted educational programs, although frequently sporadic, designed to cope with the problem It is suggested that instruction designed to promote a wiser utilization of whatever facility in reading the high school and college student has attained might conceivably turn out to be more effective than have been the direct attacks upon the reading process itself It is noteworthy that most students who are unable to learn much from what they read are also unable to learn much from oral instruction

[77] For example, "Reading and Pupil Development," *Supplementary Educational Monographs,* No 51, 1940 (W S Gray, editor)

Deficiencies in understanding In all probability there is a considerable proportion of pupils who, although having acquired satisfactory fundamental reading habits, are unable to learn a great deal from the assignments to which they are put because of inadequacies in understanding At least they learn much less than other pupils who read no better than they This problem is met whenever reading material is too difficult Deficiency in intelligence is certainly a factor Other important factors are vocabulary, sentence structure, and fund of previous experience, and, indeed, the developmental level of the pupil Deficiencies in reading may reflect deficiencies in the whole educational process To change a pupil's reading ability in a broad and generally useful sense probably means in many cases the changing of the level of his educational development — even his ability to think In such cases a few easy lessons in rapid reading seem inadequate for the job In many cases the student's limitation in reading a book stems from a cause much deeper than reading in the narrower sense

The deficiencies encountered here are not peculiar to reading, but are general to all educational media A certain background is requisite to the understanding of verbal and even pictorial instruction. A pupil who understands but little of what he reads about a phenomenon or process does not necessarily understand a great deal more when he sees a motion picture of it An appropriate apperceptive mass is essential to the understanding of anything Thus, some so-called deficiencies in reading may result from deficiencies in education, general and specific The inability to understand what one reads, assuming that reading habits are already acquired, may not result solely or even for the most part from vocabulary difficulties *per se* In specific reading situations deficiencies may be overcome, at least in a measure, by the expediency of providing an adequate background of experience It is just such specific deficiency that standard reading tests are not likely to reveal

On the importance of reading skill It is unnecessary, certainly, to make a defense of reading, and no one doubts that good reading ability is an asset Even so, the precise relation-

ship between reading proficiency and academic success is not easy to determine Numerous reports have been made on the relationship between reading test scores and school marks earned in the various academic subjects These were summarized in 1934 by McKee, for the elementary grades [78] The coefficients range from about 25 to 75, which taken at their face value appear to be rather significant, especially in view of the fact that scores on different reading tests do not correlate with each other to a much greater extent, and that the intercorrelations between school marks are likewise not much higher

However, just what construction is to be placed on the obtained association between reading scores and school marks is questionable In the first place the correlations between reading scores and marks earned in such subjects as arithmetic — even arithmetic computation — and spelling are about as high as those between reading and marks in social studies and other subjects that require a relatively large amount of reading For a group of about 500 elementary school pupils, Grades 3 to 8, whose *I Q*'s ranged from 98 to 105, McKee obtained correlations between the reading test of the *Stanford-Achievement* battery and other tests of the battery as follows reading and spelling, 55, reading and language, 66, reading and arithmetic reasoning, 56, reading and arithmetic computation, 42, reading and nature study, 71, reading and history and literature, 71 [79] It is likely that the average of the intercorrelations between the various other tests would have been about as high as the average of the correlations between reading and the other tests In standardized tests reading ability — speed and comprehension — contributes to the scores earned on such tests as history, literature, and nature study as well as does knowledge previously acquired

In the second place, any other measure of scholastic proficiency correlates with academic marks to about the extent that reading does Segel obtained the following correlations, among others, between marks earned by college students Physical

[78] P McKee, *Reading and Literature in the Elementary School*, pp 36–45 Boston Houghton Mifflin Co, 1934

[79] *Ibid*, p 40

science and economics, 55, and biology, 42, economics and biology, 44, and history, 30, history and languages, 52, and biology, 35, and English, 33, and physical science, 17 [80] Yarrow obtained the following coefficients between the *Iowa Qualifying Test Battery* and general grade point average earned by a group of university freshmen [81]

Test	*r*
Iowa Qualifying, Composite	55
Foreign Language Aptitude	52
High School Content, Composite	46
Mathematics Aptitude	44
English Training	44
Reading Comprehension (Cooperative)	38

The foregoing will serve to indicate that the published correlations between reading scores and school marks are equivocal in meaning They do not indicate that reading proficiency is specific to scholastic success, within the range in proficiency present In accord with this interpretation is the finding, in the Dartmouth study, that improvement in academic performance seldom results from improvement in rate of reading [82] There is a possibility, however, as we shall see presently that no *general* improvement in rate occurs as a concomitant of increased rate in a specific experimental situation But it seems likely, in view of the fairly low correlations between academic marks and reading test scores, which are measures of both rate and comprehension, that at the college level reading rate bears little relationship to academic marks, within the limits of reading ability possessed by college students

Since such factors as intelligence, vocabulary, general educa-

[80] D Segel, "Differential Prediction of Ability as Represented by College Subject Groups," *Journal of Educational Research*, 1932, Vol 25, pp 14–26

[81] L J Yarrow, "Measurement and Prediction of the Differential Achievement of College Freshmen," *Master's Thesis* State University of Iowa, 1942

[82] H A Imus, J W M Rothney, and R M Bear, "An Evaluation of Visual Factors in Reading," *Dartmouth College Publications* Hanover, N H, 1938

tion, and similar factors are associated with reading proficiency and also with academic achievement we should expect to find an association between reading proficiency and academic achievement But these factors are as common to other modes of instruction as they are to reading Since instruction in the fundamental reading habits will not immediately change a college student's vocabulary, his modes of thought, general education, and will probably not change his intelligence, not even his *I Q*, at all, there seems to be no great likelihood of effecting any very important improvement in academic work by reading instruction alone

IMPROVEMENT IN READING HABITS

The present discussion is limited chiefly to a consideration of improvement in the reading habits of high school and college students, students who have progressed beyond the grades in which reading is normally taught Since there are so many slow readers and so many poor readers among these groups, the high school and the college are remiss, if there are practical means of effecting substantial and lasting improvement A consideration of improvement in reading proficiency in the elementary school would take us into the field of teaching reading, a field beyond the scope of this chapter

There is a slipshod procedure by which it is easy to "show" a wholesale improvement in reading as a result of a few simple lessons From such "striking" results the notion that improvement in reading is relatively easy to achieve became somewhat common in educational psychology These results also afforded additional ground for the criticizing of teachers of the elementary grades for not doing a more competent job

Typical of the class of experiments just referred to is the procedure of rounding up the entering freshmen, of a college or university, who fall below some critical score on the reading test of a qualifying battery and subjecting them to a program of reading instruction This program, prosecuted for one or two hours a week for three or four weeks, consists of some lectures on the importance of reading plus some practice exercises and suggestions for improvement "Proof" that this treatment

is able to alter reading habits of several years' standing is the fact that when another form of the reading test is administered after training, a large percentage of the students now exceed the critical score Those who still fall below this score are given additional instruction and another form of the test at the conclusion The percentage now exceeding the critical score is taken as the percentage helped by the program of training

Common sense suggests that were reading improvement such an easy matter to achieve there would not be so many poor readers among our secondary schools and colleges We should anticipate that a fairly large percentage of the students, in the type of investigation referred to, would exceed the critical score on the second or third examination were no intervening instruction whatsoever given If the examinations were repeated several times, nearly all students should pass, even if no change took place in their fundamental reading habits The conditions are ideal for the operation of the regression effect These errors in experimental procedure can be circumvented by dividing the low-scoring students into two equivalent groups, one to constitute an experimental or training group, the other, a control group, and comparing their performance on the final test By still another procedure a program of reading instruction may be administered to a randomly selected group, the effect of which may be determined by comparing initial and final scores on suitable reading tests Incidentally, there is reason to believe that the initially proficient readers will respond to such instruction more readily than will the initially poor readers

The task of effecting substantial improvement in reading proficiency at the levels in question is vastly more onerous than we were at first led to believe Traxler, in a class of average seventh grade pupils, secured a gain conservatively estimated to be about 10 per cent pursuant to a systematic and intensive program in reading applied daily for a semester [88]

In the following paragraphs are described a few of the better

[88] A E Traxler, "Group Corrective Reading in the Seventh Grade — An Experiment," *School Review*, 1933, Vol 41, pp 519–530

experimental investigations, which have been carried out with considerable care Regarding these investigations two questions in particular should be kept in mind First, is there any evidence that the improvement effected in the laboratory carries over to normal reading situations? Conceivably, such improvement could come about as an adaptation effect to the experimental situation, without there occurring a like degree of improvement, or any improvement, in life situations Second, is any evidence presented to show that the improvement has any substantial degree of permanence? Most persons can, by pushing themselves, read faster than they normally do, and by a series of practice periods devoted to rapid reading should be able to achieve a considerable gain We wish to know whether or not they settle into old, and probably more comfortable, habits once the experiment is over

It is also thinkable that some day we may be able to tell about how fast a given person should read for the optimal result The correlations obtained between reading rate and association time, cited above, are suggestive, as are those between reading comprehension and listening comprehension Goldstein's finding that listening rate is positively correlated with reading rate is likewise significant His observation that students who could read effectively when material was presented at a rapid rate could also comprehend oral material presented at a rapid rate, and that those who could read effectively only at a slow rate likewise tended to be handicapped by rapid oral presentation, suggests the possibility that rate of reading is determined, at least in some significant amount, by a set of more or less general factors [84]

Training in eye movement There is a group of experiments that have been directed toward, or that have had as a partial feature, specific improvement in eye movements If improvement in speed of reading occurs, there must occur a concomitant improvement in one or more eye-movement features, and improvement in eye movement must bring about a corre-

[84] H Goldstein, "Reading and Listening Comprehension at Various Controlled Rates," *Teachers College, Columbia University, Contributions to Education*, No 821 New York Columbia University, 1940

sponding improvement in rate of reading But it does not follow, necessarily, that specific training in eye movement is more efficacious than training in rate without reference to eye movements, or that it has any efficacy Robinson combined both these procedures in an intensive program administered to 21 university freshmen selected at random from the lowest quarter in reading performance of a freshman class [85] Throughout a two-year period the subjects reported, individually, twice a week for 30-minute periods The training was chiefly of two kinds (1) reading of spaced material designed to reduce the number of fixation pauses and (2) practice in rapid reading of unspaced material During the first year of training, spacing was accomplished by marking off the desired units of comprehension by lines drawn through the material During the second year the practice material was presented in spaced phrases, the size of the units being gradually increased, as,

whether note taking is good or evil
(initial stages)
for the reader of your paper to know what you have read
(final stages)

Practice in rapid reading was mediated by skimming quickly to get certain details, as the finding of answers to specific questions, and by having the subject push himself in his rate Charts were prepared to show the progress

That improvement in reading performance and in eye movement did result is revealed by his results, presented in part in Table XI The significance of the values is bolstered by the fact that control groups did not improve materially on the measures in question We have no way of knowing, of course, what the relative effect of the two training procedures was

Paced practice A recent investigation by Buswell gives evidence that spacing is in no wise essential to the production of substantial improvement in eye movement in reading In his main experiment 74 adults, mostly college students, partici-

[85] F P Robinson, "The Role of Eye Movements in Reading with an Evaluation of Techniques for Their Improvement," *University of Iowa Studies Series on Aims and Progress of Research*, 1933, Whole No 39

TABLE XI

EFFECT OF TRAINING UPON READING PERFORMANCE

Measure	Initial	Final	SE Diff
Iowa Silent Reading	13 57	22 24	5 86
% accuracy	72 29	78 28	1 44
No questions tried	18 24	27 76	7 56
Words per min	213 58	332 60	5 80
Whipple Test			
Comprehension	7 21	9 88	3 52
% accuracy	62 52	63 48	21
No questions tried	10 90	14 81	4 36
Minnesota rate	12 21	18 36	4 80
Eye Movements			
Width of fixation (words)	1 05	1 70	8 33
Regressions (per word)	188	062	9.40
Duration fixations (σ)	267	253	1 41

pated in certain reading exercises, 50 minutes per day, 5 days per week, for a month Of these, 61 received the following methods treatment The first 25 minutes of each period were devoted to reading, at a controlled rate, matter presented by a film projector, the next 15 minutes were spent in vocabulary study and exercises related thereto, the last 10 minutes, to the making of laboratory records, administering progress tests, and the giving of general instructions [86]

The specially designed film projector presented one-third of a line of reading matter at a time, at a controlled rate On the first day of the experiment proper the material was presented at the subject's normal reading rate, as shown by previous tests (This phase of the work was individual) The rate of presentation was increased systematically from day to day The principal reason for showing but a third of a line at a time was to reduce the opportunity for looking back—to remove the advantage in making regressive movements It was assured that

[86] G T Buswell, "Remedial Reading at the College and Adult Levels," *Supplementary Educational Monographs*, 1939, No 50

there would be eye movement within each third of a line There was no thought that the subject would perceive each unit in a single fixation The subjects were required to read at a constant rate, to push constantly, without loitering Buswell is of the opinion that "the main contribution of any form of projection device is merely this motivating element of reading under pressure at a fairly constant speed The only virtue of the film projector is that it aids in the process of pushing on to superior reading habits" This may, however, be a matter of great importance in the case of adults whose reading habits have become more or less fixed by long practice, especially in the case of those who verbalize excessively

The effect of the exercises taken collectively is gauged by two results (1) speed and comprehension scores on a standardized reading test and (2) eye-movement data An average gain of 17 per cent was obtained in reading rate, as determined by comparing the post-training with the pre-training scores There was no change in average comprehension score On a difficult selection in which eye movements were photographed before and after training there was obtained a median increase of 25 per cent in the number of words read per fixation, a median increase of 87 per cent in the number of words read per regression, and a median gain of 9 per cent in the number of fixations per second Here the fixation time proved to be difficult to modify, as it did in Robinson's experiment

With an additional group of 13 subjects reading was paced, as it were, by the beating of a metronome rather than by means of the film projector, the other conditions of the experiment remaining the same On the whole, the results obtained with this instrument were positive and only a little less pronounced than those obtained with the film projector

Buswell found that the initially superior readers made the smallest per cent of gain in number of words read per minute The poor readers were just behind them, while both were outgained by a wide margin by the average readers As seen in Chapter XII percentages as here used are a bit tricky, since the higher the initial scores the larger is the base from which they are computed In this instance gross gain in words read per

minute seems to give a more satisfactory basis of comparison. To take an extreme case for purposes of illustration, let us consider the following *A* gains from an initial score of 100 words to a final score of 150 words, making a gain of 50 per cent, *B* with an initial rate of 400 words would have to gain 200 words per minute, not 50, to show an equal percentage gain

The gross gain in words read per minute and per cent of gain are shown in Table XII, for easy material Proportional differences were obtained for difficult material

TABLE XII

RELATION OF GAIN IN WORDS READ PER MINUTE TO INITIAL RATE, FOR EASY MATERIAL

		Words Read per Min		Gain	% Gain
Quality	N	Initial	Final		
Rapid	13	469	596	127	27
Medium	35	312	462	150	48
Poor	13	203	260	57	28

The results of Imus, Rothney, and Bear's investigation, cited previously, are in agreement with those of Robinson and Buswell, with respect to improvability in rate in an experimental situation Such improvement is usually accomplished without loss, sometimes with a gain, in comprehension scores Actually this may signify a slight loss in comprehension, or at least accuracy, since more items are attempted in the faster rate

It has been demonstrated that in the course of forced practice in reading, for a few hours a week for a month, substantial improvement in rate is obtainable To what extent this improvement extends beyond the experimental situation is a question that has not been adequately settled The permanence of the demonstrated improvement is another aspect of the problem that stands in need of further exploration In the Dartmouth investigation it was found that the improvement in rate, or the practice effect, as the case may be, did persist for one year, the limit of the investigation

The problem of comprehension When we talk about comprehension in reading we often have in mind matters other than the ability to understand, in the more limited meaning of the term For example, we often mean by *inability to comprehend* that the pupil does not know how to study, that he finds it difficult to concentrate, that he does not learn the right things or get the meanings the author intended It is as if such a pupil were reading to no useful purpose Most of these ills are ameliorated when he reads to find the answer to something he is concerned about More appropriate assignments, guidance through the use of questions and problems, and systematic appraisal of results of the reading are, from a common sense point of view, the procedures that are most likely to remedy the difficulties

The value of specific assignments, study questions for the guidance of the learner, appraisal of the results of the reading by careful examination, and the like cannot be gainsaid When the need of such aids is indicated they should be given However, the ultimate aim is the development of a degree of intellectual maturity such that they are no longer required In a sense this is the goal of the whole educational process One patent reason why the immature student has difficulty in reading is that by reason of his limited acquaintance with a given field of knowledge he does not know what the problems are Obviously, this need is to be met ultimately by the acquisition of the requisite background This may mean the postponing of the reading of a difficult book until deficiencies in background can be made up through the reading of simpler books

Students may be caused to assume a bit of self-direction, as it were, by the expediency of preparing questions themselves, as by framing the best question they can regarding the content of a paragraph or topic Since the student thus has a specific task to perform this procedure is calculated to give purpose to his reading and to require thoughtful reading

Students should read their lessons before going to class, to the end that the lectures and discussions will be more meaningful While in class they should be on the lookout for problems and questions Upon the assumption that the lecture and dis-

cussion will center around the more important problems, the student should restudy his lessons with these problems in mind Thus the second reading may become more meaningful because of the lecture and discussion

The *sine qua non* of reading is meaning, as in all perceptual processes, as noted at the beginning of this chapter It is true, however, that by far the greater amount of research, at the adult level, has been directed to the problem of rate This may have resulted in part from the psychologists' absorbing interest in apparatus It is not true that the psychologist has neglected the problem of meaning The problem of getting the meaning of what one reads is in many respects the same as the problem of thinking and learning Thus much of the data on meaning in reading is treated under other heads That is true in this book, as may be seen in Chapters VI, XIII, and XIV

Perhaps it is generally agreed that it is desirable to be able to read fast, but it is probably true that speed has received undue emphasis We should avoid giving the student the impression that he should always read fast Certainly common sense suggests that reading may often be better when done slowly The guiding factor should be the rate at which the material can be assimilated There are occasions in which the reader should stop to think The facile reader can well afford to take more time for deliberation, as required, because he is not pushed to get over his reading assignments [87]

[87] A voluminous literature is accumulating on improvement in reading In lieu of listing here an extensive bibliography, some of the more recent books, most of which make ample citations to the published research, are listed as reference material

D D Durrell, *op cit* A J Harris, *How to Increase Reading Ability a Guide to Diagnostic and Remedial Methods* New York Longmans, Green and Co , 1940 J M McCallister, *Remedial and Corrective Instruction in Reading a Program for the Upper Grades and High School* New York D Appleton-Century Co , 1936 J M McCallister, *Purposeful Reading in College* New York D Appleton-Century Co , 1942 R Strang, *Problems in the Improvement of Reading in High School and College* Lancaster The Science Printing Co , 1940 A E Traxler, "Ten Years of Research in Reading, Summary and Bibliography," *Educational Records Bulletin,* No 32 New York Educational Records Bureau, 1941 P A Witty and D Kopel, *Reading and the Educative Process* Boston Ginn and Co , 1939

THE HIGH SCHOOL READING PROGRAM

A few general remarks are added apropos of reading instruction at the secondary school level For a fuller account the reader is referred to books and articles that deal specifically with the problems [88] Sentiment seems to be gathering for a systematic and organized attack on reading at the secondary level

It has been known long since that as a general thing pupils show little growth in what is known as the fundamental reading habits — or in the mechanics of reading, if there be such a thing — in the secondary schools, and indeed very little after the fifth grade From the standpoint of reading instruction in high school the most important question is whether this situation is due to a lack of systematic instruction or to the maturation, at this period in the life of the pupils, of the psychological processes of reading The writer has no answer to this question Common sense might suggest that it is a bit of both If this be so, we still need to know how much of each

One of the salient facts about so-called remedial reading and the treatment of special or corrective cases is that the type of instruction most likely to succeed is in the main very similar to that employed in teaching children to read in the first place At some points or even at every point the instruction may be more intensified than that carried on at the elementary level, but by and large there is no sleight-of-hand or other special techniques, except for very exceptional cases, known only to clinicians or other experts It is true that the average high school teacher probably knows little about teaching reading at any level Successful procedures may be learned just as the elementary teacher learns them

Who should be in charge of the high school reading program? The statement is frequently encountered that every teacher should teach reading It is one thing for a high school teacher to be concerned about reading, to seek help here and

[88] The *Research Bulletin* of the National Educational Association, for January, 1942, gives a fairly good cross section of present-day conditions and trends and supplies a good bibliography

there, and otherwise be conscious of the problem, and another thing to know enough about teaching reading to be of much positive help Reading instruction fits in rather well with the English teachers' work, and at the present time they are doing much more with reading than any other group of teachers There is no reason why any teacher who has the time and interest may not become sufficiently expert in reading to carry on a good program In any case the gaining of sufficient mastery over the problems of teaching reading will require serious study

It appears that the specificity of reading skills has been overemphasized by some recent writers The student who undertakes to read assignments in biology or chemistry for the first time does not have to learn to read all over again, although he will encounter some difficulties Knowing what these difficulties are and knowing how to deal with them certainly has something to do with the problem of reading, but is not the same thing as reading instruction A teacher should understand that students often come to a new subject with a very limited background from which to form concepts and understandings, even when there are no serious vocabulary problems, in the strict sense of the word This is of the greatest concern in the selection of books and other reading matter It is just as important in the oral exposition, the motion picture, and other instructional media This point of view is discussed further in Chapters VI and XIII A pupil may be a good reader and at the same time be unable to learn much from his reading of something for which he is not prepared This does not mean that he needs reading instruction in the usual meaning of that term, he does need a better assignment

On higher reading skills Perhaps the problem before us can be better appreciated if we bear in mind that the presence of reading problems in high school and college is not *prima facie* evidence that reading was poorly taught or poorly learned in the primary grades Naturally, we may surmise that there is a good deal of poor teaching and learning in these grades, but it is of the greatest importance that high school authorities realize that the primary teachers cannot teach the higher read-

ing skills and that it is the obligation of secondary teachers to do so The primary skills are, of course, basic, and deficiencies therein add to the secondary teacher's burden

Reading (and studying and thinking) skills in high school are probably somewhat specific to the various subject matter areas Certainly one skilled in reading history might experience difficulty in reading algebra, or even in literature For example, Robinson and Hall obtained a correlation of 17 between reading comprehension scores in fiction and those in history, 44 between history and art, and 96 between Canadian history and Russian history [89] As indicated previously, much of the discrepancy between reading scores in different fields may be due to discrepancy in background We may also assume that the kind of thinking required also varies one subject from another, as well as vocabulary, and style of writing

TYPOGRAPHY AND ILLUMINATION

Size of type It has been shown that visibility bears a relationship to type size Luckiesh and Moss found that 6-point type (Bodoni Book) gave 27 per cent of maximum visibility, 8-point, 43 per cent, 10-point, 56, 12-point, 63, 14-point, 68, 16-point, 73, 18-point, 76, 24-point, 83, by a given method of reckoning and with 10 footcandle illumination [90] It should not be supposed, however, that these differences in visibility are attended with corresponding changes in legibility Paterson and Tinker report that for 19-pica line length there is relatively little difference in legibility of reading matter set (solid) in sizes varying from 8-point to 12-point, the range commonly used in printing The criterion of legibility was speed of reading Thus it is indicated that one does not require anything like maximum visibility for purposes of reading [91]

There is, however, the possibility that visibility is somewhat

[89] F P Robinson and P Hall, "Studies in Higher Level Reading Skills," *Journal of Educational Psychology*, 1941, Vol 32, pp 241–252

[90] M Luckiesh and F K Moss, "The Quantitative Relationship between Visibility and Type-size," *Journal of the Franklin Institute*, 1939, Vol 227, pp 87–97

[91] D G Paterson and M A Tinker, *How to Make Type Readable*, Chapter III New York Harper and Brothers Publishers

more closely associated with what we may call comfortableness, as indicated by a minimum of strain or fatigue In fact, Luckiesh believes this to be the case Paterson and Tinker found the greatest preference, as indicated by statements of opinion, to be for 11-point type, 10- and 12-point ranking next, then 9- and 8-point next, in that order In reading newspaper headlines, tachistoscopically exposed, English could find no significant differences in legibility among 14-, 24-, and 30-point sizes [92]

Kinds of type Paterson and Tinker found the book type faces in common use to be equally legible However, they vary in visibility, as reported by Luckiesh They did, however, find that the reading of American typewriter type was slower by about five per cent than book type The reading of material set in all capitals was found to be slower than material set in lower case by 12 per cent Readers expressed a decided preference for lower case, as determined by subjective judgments Bold-face and light-face type are read with equal facility, although readers express a preference for light-face type [93] Bold-face can be seen farther

Line length Paterson and Tinker report that for 10-point type, set solid, lines varying from 17 to 28 picas are equally legible, while 10-point type with a 2-point leading is read equally well in lines ranging from 14 to 31 picas Lines varying from 17 to 41 picas are equally legible when set in 12-point, set solid or with 2-point leading Lines varying from 13 to 25 picas may be read equally well when set solid in 8-point type, when set with a 2-point leading the range of equality is from 13 to 36 picas

Again the question of fatigue is raised Luckiesh finds that greater lengths, especially with smaller type face, are more conducive to fatigue, as measured by the blink technique [94]

Illumination Tinker reports that for two minutes' adaptation to each intensity of light used, intensities below 10 3 foot-

[92] E English, "A Study of the Readability of Four Newspaper Headline Types," *Journalism Quarterly*, 1944, Vol 21, No 3, pp 217–229

[93] *Op cit*

[94] M Luckiesh, *Reading as a Visual Task* New York Van Nostrand Co , 1942

candles retarded speed of reading (The intensities used, in footcandles, were 0 1, 0 7, 3 1, 10 3, 17 4, and 53 3) With 15 minutes' adaptation reading under the intensities of from 3 1 to 53 3 was equally fast The reading matter was set in 10-point type The critical point, he suggests, for 10- to 12-point type is three to four footcandles In order to provide a margin of safety he suggests an intensity of from 10 to 15 footcandles for ordinary conditions, with 20 to 25 footcandles for work requiring finer discrimination [95] However, when subjects are allowed to choose the illumination under which they prefer to read, it runs considerably higher, the average being about 42 footcandles Individual preferences ranged from 10 to 84 [96] Tinker finds that fatigue, as measured by the "h" test, incident to continuous reading for two hours is not lessened by the use of higher intensities, above the critical point However, Luckiesh and Moss found a decrease in nervous muscular tension with increased illumination up to 100 footcandles [97] Apparently different methods of measuring fatigableness give different results

LEARNING TO READ

Normally the pupil has acquired very valuable language resources by the time he enters school These resources he utilizes in the carrying out of his own thought activities, in expressing his ideas, and in understanding the ideas of others He has developed a fairly large and serviceable vocabulary and has mastered the rudiments of the logic of sentence structure and thought He has learned the use of the parts of speech and has gained considerable mastery of syntax Reading is also a form of language usage, and the learner is able to transfer most of his previous language attainment to the problem of learning

[95] M A Tinker, "The Effect of Illumination Intensities upon Speed of Perception and upon Fatigue in Reading," *Journal of Educational Psychology*, 1939, Vol 30, pp 561–571

[96] M A Tinker, "Illumination Intensities Preferred for Reading with Direct Lighting, *American Journal of Optometry and Archives of American Academy of Optometry*, 1944, Vol 21, pp 213–219

[97] M Luckiesh and F K Moss, "A Correlation between Illumination Intensity and Nervous Muscular Tension Resulting from Visual Effort," *Journal of Experimental Psychology*, 1933, Vol 16 pp 540–555

to read Reading involves the same rules and principles of language as do speaking and listening To be sure reading involves activities and types of learning peculiar to itself, but these are expedited enormously by previous language acquisition.

Presumably a pupil could be taught a reading language *de novo*, without any reference to the oral language already acquired Such must have been the process of learning to read the ideographs referred to earlier in this chapter Such an attempt would be to violate one of the most basic principles of teaching, namely, that the new be presented in terms of the old, the unfamiliar in terms of the familiar In other words, such a procedure would make limited use, rather than full use, of one of the most basic and pervasive of all conditions of learning, transfer of training — without which the pupil could not learn anything of the slightest educational importance

All methods of teaching reading make use of the pupil's previous learning, even to such matters as paying attention, obeying instructions, and wanting to learn to read Moreover, they all make use of his previous attainment in language Even the sight method makes use of previously acquired structure of language and thought All the methods that have been widely used make specific use of the existing attainment of the pupil in verbal language As seen in an earlier section of this chapter, one of the milestones in the development of reading and writing was the realization that written symbols can be made to stand for the sounds of words This development had its beginning in the phonograms and its culmination in the alphabet

Thus, the basic principle of phonographic writing, the use of a graphic sign for a sound, is utilized in most methods of teaching reading. The pupil's task is, among other things, to learn the graphic signs When he can say, or otherwise recognize, the words corresponding to the graphic signs in a sentence and apprehends what the words signify he can read the sentence Another of the ancient principles of reading and writing, the ideographic, is also used, ostensibly, in teaching beginning reading, as when words are presented with pictures Here the

pupil is led to realize that the printed word is the name of the picture, and that such symbols stand for objects The picture tells him the object for which the word stands Pictures also have interest value and probably serve to enrich the context in which the graphic symbol appears and thus to aid its learning It is a matter of the greatest importance that there be kept before the pupil the idea that the printed word, graphic symbol, or drawing is a sign that says something, and that he is reading only when he is perceiving what it says, and, contrariwise, he is not reading when he merely calls the words, or names the signs, vocally or subvocally

The A B C method The alphabetical method of teaching beginning reading stood as the prevailing one from the classical period of Greek and Roman history down to almost the middle of the nineteenth century in Europe and to about 1870 in America While this was the prevailing method, it was by no means the exclusive method, not even in classical antiquity In the Orient the sentence-word method was employed This method was used much as it is today, at least in its essential aspects, although the technique of implementing it differed somewhat from the present technique Incidentally, there is no pure sentence method of reading The so-called sentence method is a sentence-word method Words can be recognized at a glance as unitary patterns, just as letters or other objects, without phonetic analysis Sentences cannot be so recognized because languages are not made up of standard sentences One rarely ever encounters two sentences just alike, except for quotations On the other hand, words are made up of constant elements

The Greeks and the Romans proceeded, much as did our forefathers, to teach the child the letters of the alphabet, then combinations of letters into syllables, then words and, finally, sentences The sentence-word method reverses the temporal sequence, more or less As the *A B C* method was used in modern times, at least, the pupil was brought to some degree of proficiency in spelling before he was put to the task of learning to read It is markworthy that he still had to learn to read Aside from his greater mental maturity, in comparison with pupils

who begin reading activities early in the first grade as they do today, there is reason to suppose that he learned to read faster because of his former experience with words than he would have done otherwise, although this advantage may have been nullified somewhat by too much attention to individual words at the expense of attention to what the sentences said

From the standpoint of visual recognition of word forms there appears to be some advantage in teaching the beginner the letters of the alphabet — or at least of giving him some instructions therein — either prior to or in connection with the first stages in reading instruction, if indeed he does not already know them This form of instruction need not be devoid of interest, and since it is a task well within the pupil's ability, his accomplishment at this point may engender self-confidence It should be understood, of course, that this preliminary instruction does not have as its aim the teaching of the sounds of the letters The only point in teaching their names at this stage is to insure their recognition and provide exercises in form recognition, as in the reading-readiness exercises

In a limited sense, learning to read is learning the names of printed word objects The pupil already knows, and actually uses, most of the words he will encounter in beginning reading The process is in some respects analogous to that of learning the names of anything else There is good reason for leading the beginner to see this as early as possible The problem is greatly simplified because he already knows how to pronounce the words In this respect the problem of learning to read the vernacular differs somewhat from the problem of learning to read a foreign language Since the beginner's speaking and listening vocabulary is considerably greater than his reading vocabulary his attack upon a new sight word is not made entirely by phonetic analysis, but is aided by his existing knowledge of the word Naturally, there is a divergence of opinion in the amount of attention that should be given to phonics It is likely that the great majority of pupils would learn it without much detailed instruction Perhaps most teachers would agree that some pupils should receive considerable training in phonics *A priori*, it seems that a method of grouping words

having in common certain letters and phonetic elements would be sufficient, or nearly so, for most pupils

If advantages are realizable from some initial or early lessons in the alphabet, such teaching need not, and should not, be attended by lessons in spelling and tedious and uninteresting work in phonics — at least tedious and uninteresting to the beginner Phonics and spelling now follow initial instruction in reading, and spelling is taught as a means to writing rather than as a means to reading The most undesirable feature of the *A B C* method was the practice of teaching phonics and spelling in advance of the teaching of reading In the first place neither is essential to learning to read — in fact may be detrimental in the initial stages, and in the second place learning to read is so much more interesting Since most pupils are keenly interested in learning to read, it would seem desirable to cause as little delay as possible in getting them started After some proficiency in reading has been attained, the need of phonics in reading can be more easily demonstrated, and some use is also made of it in spelling Spelling is not required until the pupil is ready to learn to write

As is implied above, there is undoubtedly some transfer from spelling to reading, but there is also transfer from reading to spelling, so that either is easier to learn after the other has been taught, but other considerations would dictate the present policy of beginning with reading rather than with spelling However, there is nothing fatal about teaching a pupil his *A B C*'s in advance of or concurrently with teaching him to read

Word and sentence-word methods From the standpoint of process the word is the unit of reading just as it is the unit of speaking, and thinking From the standpoint of end result the sentence is the unit, since it is a unit of thought Thus the word and the sentence are both units of reading, but *they are not the same units* There is a sentence method of *teaching* reading, but no sentence method of reading One can read a sentence only by perceiving the individual words. In the same way one apprehends a spoken sentence Actually no attempt is made to teach the learner to apprehend sentences as units in the sense that he apprehends words as units The sentence

method of teaching reading is defended, by its advocates, on the following grounds, chiefly first, as a method of teaching word-recognition and, second, as a method of securing from the start the use of a complete expression of thought The apprehension of thought is the object of reading The learner, if he is ready to learn to read, is already accustomed to the use of the sentence as a unit of thought The sentence method is alleged to center the attention of the learner upon the true function or end result of reading from the start

When the sentence, or more appropriately the sentence-word, method is used, the pupils are given a sentence and subsequently set to identifying the constituent words In modern first readers this is likely to be a one-line sentence (or phrase) and is often accompanied with a picture whose story the sentence tells The picture is designed to suggest certain of the words and serves later, as a contextual aid, in recognizing the words The picture also has interest value Among the Orientals of classical antiquity, pupils repeated the sentences in concert until they learned them by heart and presumably attempted subsequently to identify the words of which they were made up

A bold use of the word method appeared in Comenius's *Orbis Pictus,* published in approximately 1657, a book that was translated into many European and several Asiatic languages This book contained pictures of "all the chief things that are in the world, and men's employments therein" Each picture was accompanied by an explanatory word or sentence, in two languages. According to the best modern theory, the looking upon the thing pictured will, Comenius averred, suggest its name and thus tell the learner how the title is to be read "And thus the whole book being gone over by titles of the pictures, reading cannot but be learned – and indeed, too, without using any ordinary tedious spelling – the most troublesome torture of wits"

For two centuries, approximately, following the publication of *Orbis Pictus* various scholars had advocated the practice of teaching words before letters, but the *A B C* method continued to hold sway In America Worcester's Primer (1828) recog-

nized the word method, the author stating that it was not very important that the learner should know his letters before beginning to read The word method was advocated in the Bumstead Readers in 1843, and in the Word Builder of the National Series in 1860 Horace Mann had previously espoused the word method for a number of years By 1870 it had made a good start and was well on its way toward general usage The sentence-word method had gained general recognition by 1890

The *A B C* method, which began with the teaching of the alphabet, spelling, and phonics and proceeded therefrom to reading, represents one of the great movements in the teaching of reading The other great movement is the word method with its many variations, as the sentence method, the word-picture and sentence-picture methods In so far as theory goes the variations are minor in consequence The importance of the word method and its several variations was the coming to the realization that in reading, words can and should be recognized as unitary patterns, without phonetic analysis To be sure some degree of visual analysis is present, and in the beginning stages, quite prominent It has been suggested previously that some preliminary, or at least early, attention to the alphabet may facilitate this process of visual analysis and thus serve as an aid to the beginner in the recognition of words

Today pictures are used profusely in connection with the word and sentence-word methods. It appears that Comenius was the first to use pictures in this connection, although pictures had been previously used as contextual aids in the teaching of the alphabet The value of pictures, aside from considerations of interest, lies in their serving as contextual aids The real problem in beginning reading, in so far as its perceptual aspects are concerned, is to teach the pupil to recognize the graphic symbols of words he already knows This may be done by the help of various associative processes, as graphic symbol-auditory word (supplied by teacher), graphic symbol-auditory word plus motor word (supplied by pupil), graphic symbol-picture, graphic symbol-picture plus auditory or motor word, and so on *The use of pictures permits a certain amount of self-instruction*

Something of the same purpose is served also by work-experience reading, as is seen in the work-experience charts in many first grade classrooms The sentences tell a story of some activity that the class has engaged in Knowledge of the steps in the activity lends an air of familiarity which may help to suggest words that are not at first recognized, that is, to make possible a shrewd guess, and especially enable the pupil to check the plausibility of his rendering of the sentences Work-experience reading serves these purposes best when the several sentences describe the steps in logical or temporal sequence in some close-knit process or event, so that the first sentence suggests the next The purposes are less well served when there is little logical or temporal connection between the sentences, as "We saw a bird," "A squirrel ran up a tree," "We planted some flowers"

An important lesson that the beginner should learn is that written words tell a story, as already noted This fact may be emphasized by such instruction as "Show me what tells the color of the pig" (as a card containing an appropriate sentence is held before a class), or "Show me what tells what the bird did," rather than "Show me the word *black*," or "Show me the words *flew away*"

Phonetic analysis of words may be, and usually is, made a part of reading instruction by teachers of word and sentence methods However it follows beginning instruction in reading and thus is not made the basis of such instruction as in the case of the *A B C* method Finally, there is no one *A B C*, word, or sentence method, but various versions of each Many good teachers avail themselves of any and all of them as they attempt to adapt instruction to the needs of their pupils

Reading and reasoning The rational aspect of reading has never been sufficiently emphasized We have been reminded that reading is not a "peaceful absorption of words," that reading is an active process, and so on Such observations add but little to our understanding of the reading process The rational aspect of reading is quite similar to that of listening to sentences as they are spoken, and indeed to all the more complex acts of perception — which may best be described as a search for mean-

ing This is seen when one misreads a word or misunderstands a word in a spoken sentence In such a case the sentence may not say anything logical or coherent, or the meaning of the sentence as erroneously rendered may be incongruent with the larger context in which it appears or with established knowledge or other known facts Thus the perceiver may reread the sentence or ask to have it repeated in order to construct a congruent idea Often, he only asks to have a certain word repeated or looks back, in reading, merely to verify or correct a single word We can never sufficiently emphasize the fact that in all reading and listening the perceiver must construct his own ideas. We help him to these by the stimulus of the printed page or oral discourse, but we cannot give him our ideas We can only help him to form the same ideas we have formed

The young learner often lacks a sufficient fund of experience to enable him to check the meanings he constructs from printed sentences Moreover, the very simple reading situations with which he is capable of coping are strictly limited as to contextual setting He lacks the wider purpose and tenor of a paragraph or chapter or book against which to check the meaning constructed by him By the very circumstance of learning to read, the beginner must start with what is perhaps the most difficult kind of reading, reading isolated sentences For the foregoing reasons we may see the value of pictures and work-experience charts They not only suggest words, as a kind of self-prompting, but they also enable the beginner to check the congruency of his construction

The aspects of reasoning involved in reading may be seen most clearly in the process of reading a foreign language by the translation method, especially in the case of a highly inflected language As if by way of casting reflection on this method of teaching a foreign language some writers have referred to the process as deciphering or decoding, in contradistinction to reading Perhaps we could gain some valuable insight about the psychological processes of reading by studying the act of translating Especially instructive, so it seems, would be an analysis of introspections or subjective reports by trained observers on the psychological processes involved Indeed introspective

analysis of reading the vernacular seems to have considerable promise In the case of translations, the student, upon consulting a dictionary for a word he does not know, selects the English word that best enables him to construct a sentence that makes sense — makes sense in terms of the rest of the passage, *i e* context, and is within itself a coherent and syntactically correct statement Just as the study of abnormal behavior, as it is more exaggerated, enables us the better to understand the processes of normal behavior, so it is suggested that the study of translating a foreign language, as it reveals the processes of reading in exaggerated form, may help us the more readily to understand the normal processes of reading [98]

[98] *Cf* E B Huey, *op cit*, and R R Reeder, "The Historical Development of School Readers and of Method in Teaching Reading," *Columbia University Contributions to Philosophy, Psychology, and Education*, No 2, Vol 8, 1900 H B Lamport, "A History of the Teaching of Beginning Reading," *Doctor's Dissertation* University of Chicago, 1937

CHAPTER VI

LANGUAGE, THOUGHT, AND NUMBER

Language, thought, and number are, of all the achievements of man, the most important because they are the instruments by which and from which all others have had their rise and footing. Without them man's far flung achievements would have been impossible of creation and impossible of transmission. The chief justification for treating these three subjects in the same chapter is the fact that they comprise what is known as the symbolical processes.

LANGUAGE

Knowledge of the life of the men who lived before the period of recorded history is limited to the more enduring tokens of their existence — fossil bones, shaped implements of stone, and bits of graphic art. Of their works of wood and spoken and gestural language we have no surviving records. For some intimation of these we may turn to the primitive people of our time, especially so in view of the fact that the exhumed implements, places of abode, and specimens of graphic art bear close resemblance to those of primitive man today, a fact which according to some authorities is indicative of a high degree of commonality of primitive culture.

Language of first culture people. The language of present-day first culture people makes the nearest approach to first language of any specimens available. However, it is unsafe to suppose that these specimens represent the true beginnings of language. Indeed there is positive evidence of cultural importation in the language of first culture people. The Negritos of the Philippines have apparently had no intercourse with the Malayan tribes for centuries past and their language bears little or no ostensible similarity to the Malayan. Yet there is reason to believe they had a common origin. Certain counterparts of

ancient Malayan are found in the Negrito roots, so authorities maintain

Notwithstanding the fact that the languages of first culture people show unmistakable influence of cultural importation, some of the most primitive linguistic elements and forms are still to be found in the culture of these people In particular these are gesture language, and the absence of grammatical forms in both gestural and oral language [1] Moreover, the syntax of their oral language is exactly the same as that of gestural language, namely that a sign is understood by itself or by the help of the preceding sign This syntactical arrangement does not make possible the separation of words that belong together in meaning

(1) *Lack of grammatical form* Although the signs used by primitive people are without grammatical form we should not assume that their languages are entirely lacking in grammatical categories Unless such categories are either implied or overtly expressed in the form of the words, connected thinking and communication would be impossible The structures of thought are limited by the grammatical structures of language Anticipating the subsequent section of this chapter, we may note that thinking, by definition, is the manipulation of signs, or symbols These can be manipulated only in accordance with the grammatical categories of language

Thus, while gesture language and oral language of first culture people are without grammatical forms, the same form of the same sign being noun, verb, adjective, or adverb, depending upon the usage, it is understood that grammatical categories are implied Indeed these primitive features are found in our own language today, as is seen for example in the words *well* and *store* Inasmuch as these grammatical categories are the necessary forms of thought, they are overtly expressed or implied in all languages, however primitive Thus, while any syntactical arrangement may be employed in a language, so long as it is conventional, the grammatical constructs are neces-

[1] W Wundt, *Elements of Folk Psychology*, pp 53–75 London George Allen and Unwin, Ltd , and New York The Macmillan Co , 1916 Translation by E L Schaub

sary and stable, although the formal method of expressing a grammatical category may be highly variable or be lacking entirely

(2) *Gesture* In gesture language, things, if present, are indicated by pointing If not present, as is often the case, objects are indicated in gesture by a kind of "drawing in the air" However, many such objects are not readily thus represented, a condition that necessitates an additional element in gesture language, namely the employment of some significant characteristic of the object For example, man may be signified by a pantomimic movement of tipping the hat, an incidental characteristic of man Woman is signified by placing the hands upon the breasts The sentence "The angry teacher struck the child," to employ an illustration used by Wundt, is represented by the sign for man (pantomimic tipping the hat) and holding up the index finger for teacher, this is followed by the mimetic gesture for anger, the rocking of the arms for child, and the motion for striking Translated in the syntactical order of gesture language this sentence would read "Teacher angry child strikes" There is a great deal of metaphor in gesture language For example, truth may be signified by moving the index finger forward from the lips, as if indicating straight speech, falsehood, by moving the finger forward and to the right and left, as if indicating crooked speech

(3) *Sound effects* In addition to the foregoing characteristics which primitive oral language has in common with gestural, the former makes much greater use of sound effects, especially variations in pitch, than do languages of more advanced culture That is, the meaning of a word is made to vary with the sound in which it is uttered Wundt relates that in the Ewe language large and small are indicated by the same word When large is meant, it is uttered in a deep tone, when small is meant, a high tone is used With respect to the sign for distance, a deep tone indicates remoteness, a high tone, nearness In the Sudan languages, he tells us, three tonal levels, very deep, medium, and high, are used to signify three degrees of distance Similarly a sound for taste uttered in a deep tone means bitter, in a high tone, sweet The passive voice is sig-

nified by a deep tone, the active voice by a high tone [2] In fact, we moderns similarly employ tonal effects, as is seen in the speech of actors, in irony, and sometimes in conversing with young children It is also to be found in the speech of lovers, both on stage and off

The correspondence between primitive oral language and gesture language is also seen in the employment of signs for hitherto unknown objects Wundt tells us that the Togo Negroes called a slate pencil "stone to scratch something", a kitchen, which was likewise previously unknown to them, a "place cook something", a palace, "house belong king" These expressions suggest truly that new concepts are formed out of old ones, as Wundt says, by agglomeration and agglutination Indeed one is reminded of Thomas Hobbes's dictum — largely forgotten until revived by Max Mueller and largely forgotten since — that thinking reduces to addition and subtraction

Origin of language It is generally believed that natural signs mark the beginning of language, that is, that natural signs, gesture and verbal responses, were the first signs used in communication, and that these signs had their origin in natural responses Natural signs oppose, in this usage, conventional signs The latter, which make up the bulk of the signs used in communication in advanced languages, are conventional in the sense that they derive meaning only from convention In a sense they are arbitrary and have no meaning except to those who have received instruction in their use

The word *sign*, as here used, implies that the act — verbal, manual, facial, etc — must have meaning, meaning to the originator and to the recipient In the words of Mead, as already stated (Chapter III), a sign must have two qualities it must signify and indicate Moreover, it is believed — a point emphasized especially by Mueller — that natural signs had their origin in the affective life of man, that is in his natural affective responses [3] Cries, gestures, facial expressions, and the like

[2] Wundt, *op cit*, p 66

[3] F M Mueller, *The Science of Thought* (three introductory lectures on), pp 26 ff Chicago The Open Court Publishing Company, 1887

are made as natural responses to situations, especially those involving feeling and emotion Because these situations and responses were common to all members of the group it is easy to understand psychologically how the responses made by one person would come to affect others Through the use of these natural responses intelligent beings would, as Judd points out, observe their effects or social consequences and thus ultimately come to employ them deliberately [4]

This process is seen today in the case of the human infant, who observing the effect his cries and other responses have upon others, may, as he grows older, come to employ them deliberately for purposes of affecting others It should not, of course, be taken for granted naively that every such instance involves language, that the response so used has significance to the infant There is no reason to believe that it does so at all except in the more advanced stages of his development The infant cries when in distress, subsequent ministration to his needs, which satisfies the motivating conditions, tends to re-enforce the response Spread of effect may account for his subsequently employing that type of behavior in other situations as means of having his wants administered to When action, verbal or gestural, is recognized as serving the purpose of communication, it becomes a sign or language symbol

It is easy to see how, once the use of natural signs becomes common, the next stage, namely the use of conventional signs, develops as a natural consequence Natural and conventional signs alike depend upon common experience While the making of the gestures and the uttering of the sounds did not originally depend upon learning but were made as natural responses to situations, their becoming *signs* did depend upon learning common to the originator and to the observer There is no thought that the observer instinctively recognized them as signs Thus conventional signs differ from natural ones only in that their selection is or may be entirely arbitrary A great step forward in the development of language was made when men came to recognize that any response that could be made

[4] C H Judd, *Educational Psychology,* Chapter VIII Boston Houghton Mifflin Co , 1939

could become a language symbol once it came to be accepted as a standard sign of something

Writers frequently speak of the *transition from gestural to oral language* Without important qualifications the phrase is likely to be misleading It suggests that language was originally gestural and that oral language was introduced afterward It is more likely that the two forms coexisted in primitive languages as they have since in all languages It is, however, quite significant that all advanced languages are featured by the greater relative development of oral language Among various relatively advanced primitive tribes, oral and gestural language both occupy important positions, so much so that it is necessary to build a fire in order to converse at night When neighboring tribes speak different languages, as in the case of American Indians, gesture may be used as a common language of inter-tribal communication [5]

There are various reasons why speech forms the basis of all advanced languages Speech, depending as it does upon sound as the means of transmission, is not subject to many of the physical limitations that attend gesture, such as darkness and obstructions of vision and limitation of field Moreover, were one dependent wholly on gesture, he could not use his hands for purposes of communication when they were engaged in other duties In the third place our vocal apparatus is able to produce easily and with comparatively little ambiguity a vast number of signs which our ears are able to distinguish without difficulty It is especially noteworthy, too, that all of the 600,000 words or more in our language are formed from slightly less than a half-hundred sounds Perhaps we shall never require a greater number for all the words of which we shall ever have need It is conceivable that gestural language could have been so reduced to a system that by making combinations of a few dozen basic movements we could form all the words we require But there were so many other advantages in a language based on sound and so many disadvantages in one based

[5] *Cf* E B Tylor, *Researches into the Early History of Mankind and the Development of Civilization,* Chapters II–IV New York Henry Holt and Co , 1878

on vision that gesture has been sidetracked in favor of speech in every major language

This brings us to the consideration that all communication is sensory-motor There is no authentic evidence that it is possible for a person to express his ideas except by motor means, or that it is possible for his expressions to be understood by another except as the signs he makes stimulate the sense organs of the other person That is to say, there is no proof of the possibility that minds may communicate one with the other except by the use of the sensory-motor apparatus

Language development Perhaps no aspect of man's kaleidoscopic culture has proved to be so indestructible as has his language, and none shows with such clarity and unmistakable force the nexus between any given state of culture and all preceding stages Were all history lost save that of the languages of the world, past and present, the history of man could be rewritten in broad outline from philological history For example the "loan-words," which Jespersen likens unto the milestones of history — not only of linguistic but of general history, give some indication of the mutual influence of nation upon nation By them we may learn when and in what respect the history of a people was influenced by another, and by whom the influence was exerted Likewise it is possible to ascertain whether and to what extent the influence was reciprocal "If all other sources of information were closed, we should still have no hesitation in inferring from such loan-words in our modern North European languages as *piano, soprano, libretto, tempo, adagio* and numerous others that Italian music has played a great role all over Europe" [6]

Like civilization itself, and man himself, language appears to have come out of the East, giving point to the oft-repeated expression *ex oriente lux* — light out of the East With the exception of the languages of the Chinese and Japanese, the languages of most important countries belong to a single family, the Aryan (Indo-European) Languages so different ostensibly

[6] O Jespersen, *Growth and Structure of the English Language,* p 30 Leipzig B G Teubner, 1905

as Sanskrit, Armenian, Greek, Latin, the modern Romance languages, Germanic, including English and Scandinavian, Balto-Slavic, and every tongue in Europe except the Basque, Finnish and Hungarian (the latter two belonging to the Ural-Altaic, as does the Turkish) are all members of this great family Other great linguistic families are the Semitic (including the Arabic, Hebraic, Abyssinian, Phoenician, and Syrian tongues), the Chinese or Southeastern Asiatic, and the Bantu or South African

Of the origin and early development of the so-called parent Aryan stock little is known Sanskrit was at the beginning of its extant history already a highly complex and fully developed language The bringing of Sanskrit, the ancient sacred and literary language of India, to the ken of scholars of Europe in the latter half of the 18th century represents one of the truly important events in the study of language Its tremendous value lies in part in the fact that it had been for so many centuries a "dead" language and therefore had escaped the numerous changes that take place in an active language Consequently, Sanskrit is one of our best examples of old Aryan This event marked the beginning of numerous successful philological investigations of the development of other important Aryan languages, Greek, Latin, German, English, Russian, and the rest, investigations which have yielded a bountiful harvest Up until the time these investigations began to bear fruit it was not fully appreciated that these languages, ostensibly so different, belong to the same family, and indeed present so many common characteristics, when the lawful character of the changes is understood, that there could be no room for reasonable doubt as to their kinship

Of the phonetic changes two especially have operated to make words appear so different, namely *consonant-shift* and *stress-shift* The words *pater* and *father* appear to be different enough to the beginning student of Latin When certain consonant shifts are pointed out, as any *p* becomes *f* and any *t, th,* the formal identity of the two words is seen. Likewise when it is appreciated that any Latin *k* changes to English *h,* the simi-

larity between *cornu* and *horn* becomes apparent[7] Further illustrations are the following [8]

Sanskrit	Greek	Latin	English	Russian
bhrāta	*phrātēr*	*frātēr*	*brother*	brat
pitā	*patēr*	*pater*	*father*	

Mueller maintains that by taking the 800 primitive roots, or the 120 simple concepts to which, he avers, they reduce, it is possible to derive any quantity of words From a number of illustrations of such derivations, one is selected and recounted here for purposes of illustration, namely the root *PAS*, meaning originally to tether or bind In Sanskrit this root is used in *pasu*, cattle, in Latin *pecus*, cattle, *pecunia* and *pecus*, (lawyer's) fee, from *pecus* we get *peculium*, private property, and *peculiaris*, peculiar – that which is one's own, *pax*, peace, *pacare*, to pacify, then to pay and payment, and so on In Greek this root supplies the concept to make fast and also to stand fast, πέπηγα (I stand fast), from made fast we get the concepts solid, strong, well put together, πηγός, hill or mound, παγός, and similarly for dozens of other words such as cage, net, trap, catch, boat, scaffold, scum, salt, milk, firm, thick, stout, and peg This root *PAS* has a comparable history in the Germanic tongues and in the other members of the Aryan family

"All this is only meant to give an idea of the enormous variety of thought that can be traced back (to), and, (which) took its rise from, one single root such as *PAS*, to tether Whether we speak of *peculiar* people or of *peace* of mind, of *pagans* or of the *propagation* of the Gospel, of a *page* of writing or of the *Areopagus*, of *Gefangniss*, prison, or of *ein empfangliches Herz*, a susceptible heart, we do it all by means of one and the same primary concept, – *PAS*, to tether "[9]

The utility of language has been enhanced enormously by systematization, a matter that has too long been regarded as something for grammarians to marvel at and literati to toy with

[7] Examples taken from Jespersen, *op cit*, p 22

[8] W B Pillsbury and C L Meader, *The Psychology of Language*, p 211 New York D Appleton-Century Co, 1928

[9] Mueller, *op cit*, p 40

Psychologically, it should be appreciated that systematization greatly enhances the power of language in thought and communication

All languages now in existence and all known to have existed show some degree of systematization Nor is it to be supposed that only modern languages exhibit a high degree of systematization The earliest known specimens of Sanskrit and ancient Greek had already reached such a state of development Attention is here called to but one aspect of the many ways in which languages have been systematized, and that to one in itself uninteresting enough, namely our use of suffixes *less, ism, ist, ation, ness, able, ical, ize, ite, er, ing, ed,* to mention but a few By way of observing the power these suffixes give those who use the language, let us apply them to a few words In some of the following instances the uses are not recognized by our dictionaries, but these nonce words enable us the better to see how the suffixes enrich our intellectual capital

Petticoat	Ruskin	Create
Petticoatism	Ruskinism	Creation
Petticoatless	Ruskinless	Creationism
Petticoatist	Ruskinite	Creativeness
Petticoatable	Ruskinize	Creator
Petticoatical	Ruskinist	Created
Petticoatite		Creatable
Petticoatocracy		Creationhood
Petticoatology		Creationship
Petticoatness		

Not only are suffixes in all instances convenient and economical, but they help us, in some instances, to ideas which we could not otherwise easily think or express And, by way of making transition to the next head it may be noted that without words or other language symbols organized in a language system according to convention, we could no more think the things we think every day of our lives than could a bird fly or sing without air Surely those enthusiastic reformers who would reduce the 2500 languages and dialects, approximately, of the

world to a common tongue of some few hundred words do not know what mischief they contemplate or what intellectual impoverishment would certainly ensue Granting that most of man's thoughts could, with a good deal of paring, be fitted in fairly recognizable form into such a language, there remains the problem of the means by which he is to come by all those ideas which a rich and versatile language makes possible Were the function of language merely a matter of getting thoughts expressed once they reach full maturity in one's "head," the proposed schemes would not be entirely ridiculous, but one does not develop any ideas worthy of communication except as he employs words and a language system Such a language could have practical value in communication between peoples speaking different languages

THOUGHT

Thought, as a psychological process, that is, as an act of thinking, is the manipulation of symbols It has no other usage in psychology In sensing and perceiving one apprehends, contemplates, or is otherwise aware of objects and attributes of objects as presented to his senses The apprehension, contemplation, and manipulation of things, qualities, concepts, etc not here and now present to the senses is an act of thought Things not so present are represented by symbols of — surrogates for — them Another name for these surrogates is ideas When one utilizes ideas in the process of reinstating previous impressions, or, in the language of Locke, when the mind revives ideas again and paints them anew on itself, we call the act one of recall When these symbols are manipulated in our efforts to solve problems that cannot be feasibly attacked manually, the act is known as reasoning Speculation, imagination, and revery are other uses to which these symbols are put Ideas — symbols, surrogates — are of two kinds, mental images and language symbols

Mental images A brief summary account of mental images is deemed sufficient for the satisfaction of the purpose of this text The student is referred to textbooks in general psychology for more complete historical treatment, particularly

the older texts [10] (The scope of general psychology is much broader than formerly, with the result that some of the topics then treated extensively now receive much less space)

In exposition images are usually compared with sensations, of which they are sometimes regarded as partial copies We shall here accordingly note certain points of similarity and dissimilarity between them Theoretically, there are as many kinds of imagery as there are kinds of sensation, that is to say, the number of image modalities corresponds to the number of sense modalities Moreover, images are like sensations in kind or quality Whatever the quality of sensation experienced, red or blue, triangular or elliptical, euphonious or cacophonous, bitter or sweet, the subsequently induced image thereof is the same in quality In contrast with sensations, images are, in Titchener's words, relatively pale, faded, washed out, misty, and are markedly less in intensity and duration Images are less stable, more evanescent than sensations The fact that images differ from sensations in degree, not in kind, is attested by the fact that the two are rather easily confused in experimental situations, and sometimes in life situations In commenting on our ability to distinguish them, Titchener notes that images are less sharply localized, that they change more rapidly, and in meaningless ways, than do sensations [11] The mode of arousal of images putatively differs from that of sensations The latter are aroused by appropriate stimulation applied to a sense organ, images are associatively instigated Writers have referred to images as centrally aroused sensations

In the opinion of most observers visual and auditory images predominate This may possibly come about from the fact that we are normally engaged about visual and auditory sensations much more than others Ostensibly there are vast individual differences in command of images, although this matter is difficult to determine precisely because each observer must make his report in terms of what he understands by images More-

[10] M W Calkins, *An Introduction to Psychology* New York The Macmillan Co , 1901 E B Titchener, *A Textbook of Psychology* New York The Macmillan Co , 1910

[11] *Op cit* , pp 198–199

over there are many opportunities for confusion between images and weak sensations Regarding differences from modality to modality within the same persons safer comparisons can be made, although these are not made without difficulty Titchener relates that some persons with good visual imagery, who know nothing of the laws of negative after-images, report that they get negative after-images from imagined colors and describe them correctly in terms of the laws of negative after-images Visual imagery of such intensity is a form of what is currently known as Eidetic imagery

Although Eidetic imagery is reported most commonly for the visual modality, instances of it are not unknown in other modalities For Eidetikers, the usual distinctions made between images and sensations — vividness, clearness, stability, and duration — are less marked than for the normal run of people Their images are localized in space as are sensations For the foregoing reasons the perceptions of Eidetikers are more uncertain, as they become confused with images [12] So strong are their images that they may blend with sensations, as in the case of a person who could at will "put" green leaves on trees in the dead of winter, and so strong were her auditory images of the roaring of the sea they would actually interfere with her perception of sounds [13] Incidentally, the memory (for the corresponding modalities) of such persons is faithful to a striking degree

Imagery undoubtedly serves certain important functions in thought It seems to add vividness and color to the thought processes It probably is an aid in recall in that it enables one to picture to himself events previously experienced and gives him greater confidence in the correctness and fidelity of his remembrance In certain types of constructive imagination, especially those dealing with artistic and mechanical designs, and with geometric figures, imagery appears to be of great

[12] E Jaensch, *Eidetic Imagery and Topological Methods of Investigation* New York Harcourt, Brace and Co , 1930

[13] D M Purdy, "Eidetic Imagery and Plasticity of Perception," *Journal of General Psychology*, 1936, Vol 15, pp 437–454

value Here we are talking about images of *things*, not images of symbols of things In conceptual thinking, in drawing generalizations, in all fields of general knowledge, in reasoning from cause to effect, in connected trains of thought, and in all rigorous thinking images of things are neither necessary nor sufficient Such images are probably usually present to some extent and may have some utility when present, but are inadequate as sole vehicles of man's intellectual pursuits The one necessary and sufficient group of surrogates is language symbols, including, of course, mathematical symbols, musical notation, monetary tokens, and gesture, as well as spoken and printed words

> it is evident that truth and falsity have no place but amongst such living creatures as use speech — Hobbes [14]

Now there is a dichotomy between language and images of things, but no necessary dichotomy between language and images of symbols One may define thinking as the use of images and at the same time subscribe to the proposition that language is the chief instrument of thought, and do so without committing any error in logic — provided he have in mind images of language symbols

Language symbols Certain pyschologists of the behavioristic school, notably Watson, startled the intellectual world some years ago by what was accepted by many as a novel preachment, namely that thinking is nothing more nor less than subvocal language [15] Astute scholars had long since vigorously prosecuted the thesis that language is the chief instrument of thought

Thus, in 1887 Mueller wrote "Our divine reason is really no more than human language We do not begin with thinking or ideation and then proceed to speaking, but we begin with naming We can as little think without words as we can breathe without lungs Reasoning without words is no

[14] Sir William Molesworth, *The English Works of Thomas Hobbes*, Vol 1, p 36 London John Bahn, 1839

[15] J B Watson, "Is Thinking Merely the Action of Language Mechanisms?" *British Journal of Psychology*, 1920, Vol 11, pp 87–104

more than reasoning without pronouncing words "[16] Apparently Mueller used the term *words* in this context synonymously with language for he says elsewhere "I have freely and fully admitted that thoughts may exist without words, because other signs may take the place of words "[17] Five fingers or five lines may convey the concept of five, he says, quite as well as the word *five,* an admission that is in the best Watsonian aura

Mueller has traced very carefully the history of his thesis In this we cannot here indulge, beyond the citing of a few instances to show that the idea had been widely held by leading thinkers for generations Reference has already been made to Thomas Hobbes (1588–1679) (We might have started with Abelard) Leibnitz admitted, although apologetically, that it is impossible to think without words (1679) Kant maintained that language is the greatest but not the only "instrument for understanding," which is correct He declared that "to think is to speak with oneself" Von Humboldt repeatedly stressed the inseparability of language and thought "The language of a people is its mind and its mind is its language, we can never conceive the two as sufficiently identical" Beliefs similar to those voiced above are attributed to Schelling, Hegel, Schopenhauer, and somewhat uncertainly to Mill One of the most penetrating statements to be found on this subject is one by Mansel (1850), quoted by Mueller as follows "That language (verbal or other) is inseparable from thought is rendered morally certain by the impossibility under which we labor of forming universal notions without the aid of voluntary symbols The instant we advance beyond the perception of that which is present now and here, our knowledge can only be representative, as soon as we rise above the individual object, our representative sign must be arbitrary" The following statement of Berkeley, who opposed the views voiced above, will serve to give emphasis to them "Since therefore words are so apt to impose on the understanding I am resolved in my inquiries to

[16] Quoted from L W Max, "An Experimental Study of the Motor Theory of Consciousness I Critique of Earlier Studies," *Journal of General Psychology,* 1934, Vol 11, pp 112–125

[17] F M Mueller, *The Science of Thought,* Vol 1, p 50 New York Charles Scribner's Sons, 1887

make as little use of them as I possibly can Whatever ideas I consider, I shall endeavor to take them bare and naked into my view, keeping out of my thoughts, so far as I am able, those names which long and constant use have so strictly united with them" [18]

While Mueller and his predecessors recognized the rightful place of language in thinking, they are not very explicit on how language is implemented when one thinks Watson left no doubt about his position Language is implemented by implicit speech, he averred, by implicit, mimetic movement The position commonly taken today is that thinking is accomplished by the use of images of things, images of symbols, and by implicitly saying the symbols or otherwise enacting them in a motor way

Peripheral and central theories Mention is made of two theories of the locus of thought the central and the peripheral The central theory holds that the locus of thought is the brain and it alone The peripheral theory, on the other hand, denies any such self-sufficiency to the brain The advocates regard the brain as a center of correlation They maintain that sense organs, the nervous system, notably the brain, and the muscular system, notably the larynx, are involved in symbolical behavior In thought, as in other behavior, action starts with stimulation of a sense organ and terminates in movement Thus the peripheral theory maintains a continuity between the simplest forms of reflexive behavior and the "divine reason" of man [19]

It should be clear that the abrogation of the peripheral theories is in no wise tantamount to an admission that language is not the principal means of thought If the use of language symbols does not involve implicit movement of the speech musculature it must, it would seem, involve images of words This

[18] The foregoing quotations are taken from Mueller, *ibid*, Chapter I

[19] *Cf* L W Max, "An Experimental Study of the Motor Theory of Consciousness III Action-current Responses in Deaf-mutes during Sleep, Sensory Stimulation, and Dreams," *Journal of Comparative Psychology*, 1935, Vol 19, pp 469–486 M F Washburn, *Movement and Mental Imagery* Boston Houghton Mifflin Co, 1916 J B Stroud, *Introduction to General Psychology*, Chapter XI New York Prentice-Hall Co, Inc, 1938

may come about in various ways there may be visual images of the written words, sound images of the spoken word, or kinaesthetic images of the movements involved in the uttering of the sounds, or any combination of these.

NUMBER

Once more we have occasion to observe man's intellectual debt to his cultural heritage Without a number system man could no more engage in quantitative thinking than he could engage in conceptual and ratiocinative thinking without words After all, number is a form of language Moreover, that which cannot be counted, measured, and quantified is not amenable to scientific investigation Hence we are indebted in no small degree to number system for our material advancement and much of our enlightenment

As is seen in the preceding chapter, before the development of the alphabet, picture writing was the medium of graphic expression These pictures were facsimiles of objects or conventional symbols, as in Chinese writing today A separate symbol had to be learned for each thing represented The discovery of the alphabet made it possible to represent by a few characters all the sounds used in a language system Similarly, without a *number system* we should require a separate and distinct name and graphic sign for each quantity represented To count a million we should require a million different symbols Even the mastery of this stupendous task would enable us to do little other than enumerate We could not add or subtract except by counting forward or backward, or multiply, or divide or otherwise treat data mathematically, except by simple enumeration

Primitive use of number is found in pictorial representation The ancient Egyptian represented one camel by drawing one such animal, five camels, by five pictures, and so on Later on, one camel and five marks signified five camels The Apache Indian kept track of his ponies by placing a pebble in a little sack for each pony in his possession As the supply increased or decreased, pebbles were added or withdrawn — a form of counting by analogy

An essential condition of a number system is that it have a base, of which several have been used The Babylonians used a base of 60, from which our system of chronometry — 60 minutes and 60 seconds — is thought to be derived The American Indians and the Mayas of Yucatan developed a system on a base of 20 The Hebrews and Romans used a base of 10, as we do

The Hindu people from whom our system is derived, by way of the Arabians, expressed numbers by the use of 10 symbols — 9 digits and zero By these 10 symbols any quantity — a school teacher's salary or the war debt — can be expressed without ambiguity However the vast superiority of the Hindu system lies not in the fact that it makes use of but 10 characters — the Romans used only 7, but in the use of *position* and a symbol, zero, as a *place holder* In the expression 222, the first 2 on the right means two ones, the next, two tens or 20 ones, the next, two hundreds or 200 ones *Thus any one symbol may express different quantities depending upon the place it occupies* In the Hindu system a symbol has one signification indicated by its name and another indicated by its position This system is made possible by the use of zero as a place holder That is, zero used in any given position indicates the absence of any significant symbol or quantity at that position In the value 3004 the zeros indicate the absence of tens and hundreds Otherwise we could not by our present system write three thousand and four by the symbols 3004

The Hindu number system is thought to have been introduced in Europe about 1000 A D by Arabian traders It was not used extensively in commercial transactions, however, until about 1700 because, for one thing, of the ease with which the notations could be altered and the accounts falsified

The meaning of number The last decade has seen some shift in the direction of a greater emphasis on meaning in the teaching of arithmetic, notably at the lower grade levels Perhaps this is to some extent a reflection of a change in the philosophy of teaching arithmetic — not a radical change, but one placing greater emphasis on quantitative thinking and correspondingly less emphasis on "lightning speed" in computation At the lower grades less attention is given to formal drill than

formerly and more attention to understanding The foregoing is not meant to suggest that drill work has been or should be dispensed with but merely to show that as the philosophy of teaching arithmetic has changed the methods have also changed

One kind of understanding aimed at in the early stages of the teaching of number is that of how one tells "how many" Another is the understanding of our number system Still another is concerned with number concepts Some of the commercial workbooks now feature these aspects of teaching arithmetic The very young learners are given exercises in counting and in using counting as a means of finding out how many, attention being called to the fact that the last "number name" tells how many The learners are given additional practice in expressing quantity In the beginning any correct method is accepted For example, *five* may be told in 11111, 111 11, 1111 1, and in various other ways Counting by analogy is encouraged It is maintained that all of these methods aid the learner in gaining the meaning of five A little later he is encouraged to use the conventional and the most convenient way of writing this quantity

The young learners (for example, in the early lessons of the second grade) are given instruction in the meaning of position Attention is called to the difference between the *one* in 10 and the *one* in 1, the *two* in 20 and the *two* in 2, and so on Some teachers make good use of the abacus for this purpose The function of zero as a place holder is also made the object of instruction The quantities 20 and 2, for example, may be presented and the pupils invited to say what tells whether the 2 means two ones or two tens Attention is also called to the fact that twenty, thirty, forty, fifty, etc are but other names for *two tens, three tens,* and so on

Spitzer's manual provides exercises for the development of the following elementary number concepts (1) the serial character of number, (2) counting to find "how many," (3) the relationship between ones and tens, and (4) the idea of collection The first three of these have been touched upon Some teachers seem to make good use of the methods of counting and

expressing quantity found among the most primitive tribes, using the fingers, marks, or other objects, and especially their methods of grouping

The use of standard reference points is advocated as a method of teaching young learners the better to understand number concepts Indeed, the conscious use of such standards is indispensable in the understanding of all but the most familiar quantities even by adults The statement that the area of the U S S R is 8,819,791 square miles is certainly not very meaningful to the average reader, nor does it grow more meaningful as he looks at the numbers It is only by comparison that this quantity may be given meaning An American reader might be interested in comparing this area with that of the United States, or with the continent of North America The finding that the area of Russia is nearly three times that of the United States, or nearly 800,000 square miles larger than the continent of North America tends to satisfy the reader that he knows how big Russia is The process of understanding quantities is really the same as the process of understanding anything, namely the unknown in terms of the known

We may see this tendency in our difficulty in comprehending relatively long distances expressed in feet or yards, for which we do not commonly hàve standards of reference as we do in miles In the height of mountains we do have standards in terms of feet, as in Pike's Peak or Mount Everest The reader frequently converts unfamiliar units into familiar ones The statement that an army in an offensive operation advanced 9000 yards may be converted into the appropriate number of miles The average reader comprehends the larger distances in terms of miles better than in terms of yards for the reason that the former accords with his experience He has reference points for miles because longer distances have, in his environment, commonly been expressed in miles rather than in yards Our difficulty in thinking in terms of kilometers does not arise so much from the fact that we do not at once know how many feet in a kilometer as from the fact that we have no standard references

When we read that an invading army has gained 55,000 square miles of the defending country's territory, we seek to

evaluate the extent of the loss by the reflection that this captured territory is about equal to the area of Illinois, that it is a certain fraction of the total land area of the invaded country, and so on Thus one aspect of mental development, the ability to understand quantity as expressed in number, is accomplished by the building up of standards of reference

In the interest of hastening the formation of such reference points it is advocated by some authorities that a frank attempt be made to teach them in lessons and exercises planned specifically for the purpose For the larger distances some teachers advocate the use of 1, 10, and 100 miles, approximately, as reference points Distances between neighboring towns, the time required to travel from one of these towns to another, are utilized in the teaching of concepts of distance For shorter lengths such standards as the height of the school room, the length of a city block, and the like are utilized Similar procedures are put into practice for areas One such reference point is the area in square miles of one's own state [20]

The foregoing adds up to this it is psychologically impossible to conceive large quantities except in terms of reference points These reference points must be learned if one is to have command of them It is deemed advisable to do systematically and by intent, in so important a matter, what otherwise must be left to caprice

We actually build up our concepts of abstract numbers in a manner similar to that in which our standards were developed by our ancestors, one important difference being that we start with standard systems of measurement and work backward, as it were, to reference points such as those on which our forebears were forced to rely in thinking and communication Spatial data are continuous and are not formed of discrete units Men of less advanced culture invented, as Judd states, wholly artificial units in so far as space itself is concerned Long distances were described in terms of so many days' journey or the number of moons required to traverse the distance, shorter distances, in terms of an arrow flight or a stone throw, still shorter ones in terms of a human foot or the width of the hand Like-

[20] H F Spitzer, *A Manual for Teachers of Arithmetic* (In MS)

wise in the field of weights, concrete objects served as a means of thinking about the abstract The *grain* was one such unit for small weights, the *stone*, for larger ones Thus, while our pupils start with ready made standards of measurement, the meaning of the quantities designated by such expressions as 10 miles, 10 pounds, 100 yards, 100 acres, and the like comes through experience with the concrete [21]

Perhaps no system of measurement represents so strikingly the relationship between the origin of that system and the development of the conceptual units of it as does money As Judd suggests, money is the most abstract of all the arbitrary means of measurement Most of us engage enough in thinking about money, but it has not been sufficiently appreciated that money (monetary symbols) is a means of thought We encounter here in addition to the kind of abstraction already discussed, quantity, a new kind of abstraction, value Thus we use monetary tokens not alone in exchange for articles of commerce but also as tokens of value in all our thinking about commercial articles We may think dollars worth of wheat quite as easily as bushels of wheat

When men first began to engage in commerce the objects of value themselves — articles of food, clothing, warfare, and hunting — were exchanged The values were concrete and tangible These concrete objects did not at first lend themselves to abstract thinking Later on, certain *standard* media of exchange came into use, such as tea, tobacco, beads and shells, beaver and buffalo skins As any such medium became standardized in a group it at once became a means of quantitative thinking A value could be placed upon any article of commerce in terms of the conventional medium of exchange, as "worth 5, 10, or 50 beaver skins, pounds of tea, hogshead of tobacco" Here then are fulfilled the conditions of abstract units of value A great advancement was made, not alone in commercial transactions but also in abstract thinking, when governments undertook to guarantee the purity and weight of metals used in coins We have a good example, on the negative side, of the abstractness of monetary tokens in the expression "not worth

[21] C H Judd, *op cit*, Chapter XV

a continental" — a piece of continental currency issued in the Revolutionary period

Children of all advanced cultures today find a complex system of coinage already in existence Their task is to learn the meaning of coins as media both of commercial exchange and of quantitative thinking, thinking that involves value so that they may avoid dupery, and thinking that involves quantity in a numerical sense so that, for one thing, they get back the right change A child comes to understand a dollar, 10 or 100 dollars, in terms of exchange value, and of course, to some extent in terms of the number of units contained There are various ways of knowing the meaning of money just as there are of knowing the meaning of any other system of measurement For example, one way to know a rod is to be able to mark off approximately a distance of that length, another is to know the number of other units, feet, inches, etc , contained in a rod, or how many rods are contained in some larger unit.[22]

MAKING INSTRUCTION MEANINGFUL

The only way to make instruction meaningful is to make the presentation in terms of what the pupil can understand On this point there is nothing to be added to the second formal step of Herbartianism instruction proceeds from the familiar, and in terms of the familiar, to the unfamiliar All understanding is predicated on previous understanding

Educators often seem to mean by "making instruction meaningful" making it worthwhile, vital, interesting, making it further the pupil's purposes or even the purposes of society But for the present we shall confine ourselves to the first construction, that of understanding the symbols of instruction

As was pointed out previously, things do not themselves have meaning, but are endowed with meaning by organisms by virtue of what they have learned about them This observation should tell us, if we did not know from common experience already, that the symbols of instruction must have meaning *to the learners*, if they are to serve as media of instruction This

[22] *Cf* C H Judd, *Education as Cultivation of the Higher Mental Processes*, Chapter IV New York The Macmillan Co , 1936

goes beyond knowing the accepted definition of words The learner's background – apperception mass – must be such that he is capable of understanding the subject of instruction This implies that there shall be sufficient previous experience to enable him to understand the use to which the symbols are put in a particular instructional situation

This is implied in the Herbartian five steps, in "object lessons," and is a justification for the "field trips" which feature so prominently in the better schools today, and for the extensive use of visual aids, as previously noted Thus, while symbols are, and perhaps shall be, the principal media of instruction, the use of symbols in the absence of adequate "apperception masses" may result in little besides verbalism, and little of that, because verbalistic learning is extremely difficult

This leads us to an instructional problem of the greatest significance, individual differences, to anticipate a topic given extensive treatment in Chapter XII Suffice it to say at the present that approximately a third of the pupils in a given grade do as well on educational achievement batteries as the average of the pupils one grade above, and about a third do no better than that of the pupils one grade below About 10 per cent deviate by two full grades above and below, and two or three per cent, by three full grades From this situation we may infer that differences in mental ability, vocabulary, and previous knowledge, are so great as to make it certain that vast individual differences prevail with respect to the meaning the symbols of instruction have We see also the deplorable state of affairs to which the use of a single textbook in a class leads. The use of free textbooks, which permits a collection of a number of different books treating a particular subject, increases the probability that a pupil may be given a book that is about right for him Unfortunately it does not guarantee it, because a suitable range of books is scarcely to be found In hardly a single subject at a single grade level do textbooks adequately provide for individual differences The situation is somewhat better in the case of collateral materials With a suitable array of books it is possible to put in the hands of most students instructional materials which, in terms of problems raised, vo-

cabulary, previous experience, and mental ability, are meaningful to them individually

The learner must form his own conceptions and understandings The symbols of instruction do not depict or mirror, except in a figurative sense, they *suggest* Learning is pretty much a matter of construction One constructs new ideas or understanding out of the new and the old Thus, the learner forms his understanding out of his perception of the symbols of instruction and his fund of experience

If a pupil finds a reading assignment to be too difficult, that is to say, if the symbols are so lacking in meaning (for him) that he does not grasp the sense of what he reads, the remedy lies not as a general thing in putting him to reading the assignment over and over again Exhortations to study hard, to try, are not only worthless, on the whole, but stifle any spontaneity or enthusiasm for the task which the pupil may have had, as he "butts his head" against a task that will not yield As is seen in Chapter XIII, there is ordinarily little justification in recommending to any student that he read an assignment a second or third time This is so, first, because there are better ways to gain a mature understanding of a subject of instruction, and second, because investigations show that on the average the yield from the additional perusal is comparatively small The pupil should be given a type of instruction that he can understand This may mean using simpler material, material giving a fuller description or presented in a simpler vocabulary and literary style, and, in some instances, in delaying instruction until the pupil's *M A* increases or until an adequate background of experience can be established It may also mean field trips, motion pictures, and other devices for establishing background The problem of reading is largely one of understanding It does not necessarily follow that a pupil who cannot understand a selection when he reads it can understand it when it is read to him He may simply lack the background necessary to an understanding of it, as noted in a previous chapter

Again, to anticipate a subsequent chapter, investigations

show that pupils learn on the average considerably less than the anticipated number of facts and concepts presented in what they read, as shown by the inability to recall them or to say anything meaningful about them immediately afterward Some educational writers have taken this finding to signify that the material of instruction is too difficult The conclusion is probably correct, but it does not necessarily follow from the data The situation is due, in part, to the fundamental nature of mind The mental processes do not operate as a camera, they are selective and imperfect, and much of the simplest content goes unlearned and unnoticed A person may understand every sentence and every word of a selection as he reads it and at the same time be unable afterward to give any intelligible account of much of it, especially in a lengthy selection Even so, the question of the appropriate level of difficulty of a book for the maximum learning result is a vital one, but one for which no definitive answer, nor even an approximate one, is at hand Instruction should challenge a pupil But to be a challenge the problems should be pertinent to his experience and ability A pupil is not effectively challenged by a problem that is too difficult for him

Horn is of the opinion that most textbooks in use in the elementary school are too difficult Courses of study, he says, contain numerous and difficult ideas These ideas are often presented chiefly, and sometimes solely, in a single textbook, which, in order to be available as a "sufficient textbook" treats a wide variety of subjects, and because of limitations of space treats them somewhat abstractly "The generalized statements which the books provide may symbolize general ideas for the author and perhaps to the mature reader to whom the ideas are already familiar, but the statements have no such meaning to the student the detailed data for making these constructs are not provided in the books, nor can it be assumed, in most instances, that these data are known to the student" [23] Scott

[23] E Horn, "Language and Meaning," *The Psychology of Learning*, Forty-first Yearbook, Part II, pp 389–390, National Society for the Study of Education Bloomington, Ill Public School Publishing Co , 1942

and Myers observed in an investigation published in 1923 that pupils (Grades 5–8) often have vague and erroneous notions of terms in history and geography frequently used by them [24]

Various analyses of prevailing textbooks in the elementary fields, for example the investigation of Ritter, have revealed that even in a single course such as fourth grade geography the pupil encounters a vast number of technical and to him unusual words [25] Ritter found 2195 such words in a single textbook in geography for the fourth grade Thus, in this one course the pupil meets about ten technical or unusual terms per day The consensus of opinion of analysts is that the number of such words is much too great

CULTIVATION OF THE HIGHER MENTAL PROCESSES

All education is in large measure a cultivation of the higher mental processes, even instruction in the basic skills or so-called tool subjects Mathematics is in a sense a tool subject, but the study of mathematics is also a cultivation of quantitative thinking Words, syntactical arrangements, grammatical forms, and other aspects of instruction in language are tools of writing and speaking, and also tools of thinking A pupil does not require mastery of a language unless he wishes to think! By the cultivation of the higher mental processes is usually meant instruction in reflective, relational, and inferential thinking

Teaching pupils to think critically There are two general sources of error in the results of thinking, erroneous or insufficient information and erroneous methods As is indicated in a previous chapter, much of the theorizing about migration of birds has been erroneous because the theorists have not availed themselves of all the existing information, such as the fact that birds may fly by night, may fly across trackless oceans, that the birds of the year may use a different route

[24] F Scott and G C Myers, "Children's Empty and Erroneous Concepts of the Commonplace," *Journal of Educational Research*, 1923, Vol 8, pp 327–334

[25] O P Ritter, "Repetition, Spread, and Meanings of Unusual, Difficult, and Technical Terms in Fourth-grade Geography Texts," *Doctor's Thesis* State University of Iowa, 1941

from that taken by the old birds or may depart at a different time, and that the time of departure of a given species may be highly regular from year to year Accurate and complete information is required for definitive conclusions Therefore the learning of facts, training in finding facts, and especially the inculcation of a wholesome respect for them, and the development of the habit of withholding judgment until the facts are known and of refusing to take a chance on thinking without sufficient information, and of recognition of the tentative character of thinking when sufficient information is not available, are all means of cultivating the thought processes Once a person becomes conscious of the attitude of others toward his opinion and gets a high regard not for his own opinion but for the evaluation others place on his opinion, an important step in the development of good thinking has been achieved

A healthy emotional condition that permits the individual to use facts wisely, and that induces him to do so, is an important condition to straight thinking

The term *learning facts* is equivocal Those who deprecate the learning of facts as the chief means of getting an education seem to have in mind what may be characterized as the learning of incidental detail or some pat verbal statement about facts There is another school of thought that insists that such teaching is not conducive to learning facts The pupil, under this tutelage, does not really *know* the facts, it is averred, but merely some of the details about them The processes of arriving at a *full* knowledge of facts requires the operation of all the processes of reflective thinking According to this point of view there can be no dichotomy between learning and utilizing facts They are not really learned until they are understood, which means relational thinking, reasoning from cause to effect, and the like The controversy springs from terminological ambiguity, but the issue is a very real one, and one on which there would probably be essential agreement among educators were the terminology straightened out Discussion cannot proceed intelligently until an advocate of one or the other point of view defines what he means by *learning facts*

We may agree that facts cannot really be learned as isolated phenomena, without reference to the conditions that led to them and the conditions to which they lead, without knowing their relationship to other facts, without inferential thinking, without knowledge of their application Facts are not thoroughly understood except when these conditions are met, and pupils are being taught how to think when facts are thus learned But assent to the foregoing does not alter the fact that pupils may try to learn them otherwise and that teachers may think they have taught facts when pupils can make some statements about them They have, of course, taught them to a degree, but not to a sufficient degree Perhaps it makes no very material difference whether we say there should be more thoroughgoing teaching of facts, if this instruction has as its aim a fundamental understanding of facts, or that there should be added to the teaching of facts virtuous instruction in the use and interpretation of facts By either objective facts are learned better and reflective thinking is cultivated By either recommendation pupils should stop trying to learn facts as isolated phenomena There is doubtless much so-called learning of facts that does not result in a real understanding of them or in the ability to apply them in any useful way

Need of instruction in critical thinking The work of Tyler in this area shows that the application of facts and their utilization in inferential thinking are not necessary outcomes of the learning of facts, learning them to the degree of being able to endorse or reject statements about them This finding is the more serious in its educational import because facts serve the purpose of education, chiefly, to the extent that they lead to general knowledge, to understanding, to abstract, conceptual, inferential thinking

In connection with his research on this subject Tyler administered tests, in the various courses indicated in Table XIII, designed to assess the pupil's (1) knowledge of factual information, (2) knowledge of facts and their application to new situations, and (3) ability to draw inferences from the facts presented in the course The table gives the correlations between the three measures The coefficients are distressingly

TABLE XIII

CORRELATIONS BETWEEN SCORES ON TESTS OF (1) INFORMATION, (2) INFORMATION AND APPLICATION OF PRINCIPLES, AND (3) INFERENTIAL THINKING

Course	N	r_{12}	r_{13}	r_{23}
Agric'l Engineering 401	37	34	28	32
Botany 401	485	41	34	36
Botany 402	327	37	33	33
Business Organization 401	60	31	26	29
Chemistry 411	77	42	20	32
Economics 401	210	39	32	25
Economics 402	287	36	27	24
Geography 401	128	30	24	27
History 401	473	22	29	26
Home Ec 401	73	35	31	30
Home Ec 402	62	28	26	28
Statistics 838	47	41	51	43
Zoology 401	684	39	34	37
Zoology 402	431	34	42	38

low, especially in view of the fact that the tests are allegedly highly reliable This work was done at the university level [26]

Tyler's findings are supported by investigations conducted by Bedell [27] and Billings [28] The latter obtained correlations ranging from 35 to 59 between problem-solving ability and fund of information in various fields The moral in these investigations is that the facts were not so learned as to lead to

[26] R W Tyler, "The Relation between Recall and Higher Mental Processes," in C H Judd, *Education as Cultivation of the Higher Mental Processes*, pp 12–16 New York The Macmillan Co , 1936

[27] R C Bedell, "The Relationship between the Ability to Recall and the Ability to Infer in Specific Learning Situations" Kirksville, Mo *Bulletin of the Northeast Missouri State Teachers College*, 1934, Vol 34, No 9

[28] M L Billings, "Problem Solving in Different Fields of Endeavor," *American Journal of Psychology*, 1934, Vol 46 pp 259–272

general knowledge or to abstract and inferential thinking to the extent that is deemed desirable

Data supplied by Campbell and Whittaker indicate a need of specific instruction in critical thinking The former, investigating prejudiced thinking in elementary and high school pupils, found the percentage (79) of senior high school pupils who endorsed biased statements about racial and national groups practically equaled that (81) of the pupils at the elementary level [29] Whittaker's investigation of open-mindedness toward various political and economic problems showed little change from the seventh to the twelfth grade "Twelfth grade pupils were only slightly less likely to subscribe to extreme statements than those of the seventh grade" [30]

Such findings have been taken by some writers as evidence of the undependability of transfer It is more likely that the trouble arises from the fact that critical thinking was never taught in the first place Such instruction — indeed all instruction — must depend very largely upon transfer for its functional operation Thus, Commins asserts "The child's progress in the realm of thought is basically a matter of facilitating the use of previous schemes of organization in the face of novel material" [31]

Inasmuch as most learning activities are improvable, it is reasonable to assume that the situation can be mended to a significant degree Toward this end the writer ventures to suggest that a frank attempt be made to teach the implication of facts, to apply them as they are taught, to interrelate them, to show how they fit into a system of general knowledge, to the end that the pupil's knowledge of facts and his ability to use them will be increased In other words, a serious application of the Herbartian five steps, minus the emphasis upon their *formal*

[29] H M Campbell, "Prejudiced Thinking of School Children," *Teachers Journal and Abstract*, 1930, Vol 5, pp 443–448

[30] M L Whittaker, "The Measurement of Attitudes toward Current Political and Economic Problems among Junior and Senior High School Pupils," *Journal of Experimental Education*, 1933, Vol 2, pp 65–92

[31] W D Commins, *Principles of Educational Psychology* New York The Ronald Press, 1937

aspects, is recommended We may also anticipate this further result, namely that under this program the students will learn not fewer facts, but more, and will learn them better

A friend of mine, visiting a school, was asked to examine a young class in geography Glancing at the book, she said "Suppose you should dig a hole in the ground, hundreds of feet deep, how should you find it at the bottom, — warmer or colder than on top" None of the class replying, the teacher said "I'm sure they know, but I think you do not ask the question quite rightly Let me try" So, taking the book, she asked "In what condition is the interior of the globe?" and received the immediate answer from half the class at once "The interior of the globe is in a condition of igneous fusion" [32]

Sources of error in thinking Perhaps an examination of some of the more common sources of error in thinking may be of some value to the teacher in his considerations of how to teach pupils to think Among these we may suggest the following, without regard to the order of their importance (1) failure to note negative evidence, or failure to give it adequate weight, owing to existing biases or the tendency to make hasty generalizations, (2) undue influence of feeling, failure to be objective and realistic, as in the tendency to give undue weight to facts that accord with one's own wishes, prejudices, and preconceptions, (3) overgeneralizations — assuming that if a thing is true of some members of a class it is also true of all other members, (4) insufficient knowledge and experience, (5) inadequate understanding of terms, and the use of vague and ambiguous terms, (6) failure to recognize the possibility of multiple causation, (7) reasoning from false analogies, (8) interfering effects of an inflexible mental set,[33] especially important in reasoning, (9) failure to give proper weight to the various

[32] W James, *Talks to Teachers on Psychology and to Students on Some of Life's Ideals*, p 149 New York Henry Holt and Co, 1916

[33] N R F Maier, "Reasoning in Humans, I On Direction," *Journal of Comparative Psychology*, 1930, Vol 10, pp 115–143 S N F Chant, "An Objective Experiment on Reasoning," *American Journal of Psychology*, 1933, Vol 45, pp 282–291

word elements,[34] as in Thorndike's usage of *over-potency* and *under-potency* of terms[35]

Experimental investigations Some of the sources of errors in thinking listed in the foregoing paragraph can be considerably reduced by training, and there is a possibility that most of them can be reduced to some degree Certainly information and knowledge of terms can be taught, as, perhaps, can a deep-seated respect for facts and a set toward the precise use of terminology It also seems that errors owing to pre-existing affective attitudes could be reduced by well-conceived instruction, especially so if something akin to counter-affection can be brought to bear — a condition in which the pupil derives satisfaction from straight thinking, from being right, and in which he becomes conscious of the valuation others place upon his reflections and ashamed to talk without knowing what he is talking about Some of the other sources of error, especially reasoning from false analogy and to some extent inflexibility of set, would seem not to be so readily correctable by special instruction

Pervading all the conditions of thinking, erroneous as well as plausible and valid, is the factor of intelligence There is no known way of making an astute thinker out of a dullard But it is reasonable to suppose that the quality of his thinking with respect to the problems he is capable of passing judgment upon is also amenable to improvement by instruction Washburn's investigation of the relationship between reasoning ability and general mental ability, as indicated by excellence of academic

[34] E L Thorndike, "Reading as Reasoning a Study of Mistakes in Paragraph Reading," *Journal of Educational Psychology*, 1917, Vol 8, pp 323–332 E L Thorndike, "The Psychology of Thinking in the Case of Reading," *Psychological Review*, 1917, Vol 24, pp 220–234

[35] *Cf* E M Glaser, "An Experiment in the Development of Critical Thinking," pp 26–29, *Teachers College, Columbia University, Contributions to Education*, No 843, 1941 E L Thorndike, "Improving the Ability to Read," *Teachers College Record*, 1934, Vol 36, pp 1–19, 123–124, 229–241 J C Dewey, "The Acquisition of Facts as a Measure of Reading Comprehension," *Elementary School Journal*, 1935, Vol 35, pp 346–48 R Gans, "A Study of Critical Reading Comprehension in the Intermediate Grades," *Teachers College, Columbia University, Contributions to Education*, No 811, 1940 I A Richards, *Interpretation in Teaching* New York Harcourt, Brace and Co , 1938

work, throws some light upon the conditions of valid thinking [36] For her subjects, Vassar students, reasoning ability (on verbal problems) was related to academic achievement, although excellence in the latter did not guarantee excellence in reasoning, either verbal or mathematical However, excellence in verbal reasoning was usually accompanied with high academic achievement Mediocre and inferior reasoning ability did not preclude high academic achievement, although low academic achievement did tend to preclude good reasoning ability Good mathematical ability did not guarantee good verbal reasoning ability or good academic standing Inferior mathematical ability proved to be predictive of inferior achievement in verbal reasoning and academic standing to a greater extent than was good mathematical achievement predictive of good verbal reasoning and academic achievement

It is idle fancy to expect to be able to produce a golden age of reason in the public schools But an improvement of one per cent is worth working for, and an improvement of 5 or 10 per cent over prevailing conditions might be sufficient in certain vital instances to change the course of history Numerous investigations have shown that the pursuance of courses of study does not necessarily result in the ability to think critically in the area of those subjects Superstition, prejudice, emotionalized attitudes, reasoning from insufficient data, and tendencies to make snap judgments may be as much in evidence in the area of a subject after taking one or several courses in that subject as before [37] While there is a tendency for the student who learns the most facts to be able to make the best utilization of facts in reacting to problems to which they are pertinent, the possession of some degree of factual information does not guarantee a wise use of such information That there is a relationship between factual information and application may be inferred from the fact that both are positively related to intelligence Good thinkers have the facts, or secure them before

[36] M F Washburn, "Mathematical Ability, Reasoning, and Academic Standing," *American Journal of Psychology*, 1937, Vol 50, pp 484–488

[37] Glaser, *op cit*, pp 43–72, gives a good review of the experimental data supporting this statement

drawing conclusions, but persons may possess a good deal of factual knowledge of a sort and not be good thinkers Similarly, good thinkers are intelligent, but all intelligent persons do not make good use of their intellectual capital [88]

The learning of facts is not to be dispensed with Knowledge of facts and a wholesome respect for facts are major educational objectives It is the attempt to learn *mere* facts, facts as isolated phenomena, that is to be decried Certainly one of the chief reasons why so much thinking is incompetent is that the thinker simply does not know the facts in the case There is no surplus of factual knowledge There is hardly ever enough However, if thorough, well-rounded, useful knowledge of facts can be acquired only at the expense of teaching fewer facts — and such is the case unless we can learn to teach them more effectively — then this remedy is heartily recommended *Factual information should be taught or learned only when it contributes to the understanding of something Were the acquisition of specific items of information thus always made subordinate, there would not be any question of learning too much factual information, or of learning useless information, or information that cannot be applied* Rather the problem would always be to acquire enough information to make an intelligent attack upon a problem and to reach a valid conclusion If the teacher and the pupil start with a problem — a problem that is meaningful to the pupil, one that, in the light of his mental development, he is ready to consider — and proceed to a search for and an examination of the facts relative to the case, one of the prime conditions for the development of critical thinking is met (*cf* Chapter XIII)

Another conclusion about the development of critical thinking to which the experimental results lead is that the training should be specific to the end in view Training should be applied at the point of error, as it were If the teacher wishes to combat prejudicial thinking and tendencies to reason from insufficient data, to disregard negative evidence, and the like, or wishes to fortify against propaganda, specific instruction should

[88] *Cf* P M Symonds, *Education and the Psychology of Thinking* New York McGraw-Hill Book Co, 1936

be planned for each Objectives in the development of ability to think should be formulated in detail, and exercises specific to each detail, planned and implemented There are a good many things involved in critical thinking An exercise that is specific to the development of one aspect may leave the other aspects unaffected Critical thinking is not some unitary ability which may be cultivated in its entirety when some one thing is done, however well, in the name of thought development

There is a fairly large and, on the whole, encouraging literature on the subject at hand Cited here are investigations by Curtis [39] on the development of scientific attitudes and dispositions to avoid narrowmindedness, by Caldwell and Lundeen on instruction designed to dispel unfounded beliefs,[40] by Zapf on the efficacy of training in science in dispelling superstitious beliefs,[41] by Downing on the relationship between the number of courses taken in science and ability to do scientific thinking,[42] and by Noll on the relationship between habits of scientific thinking as measured by tests of accuracy, suspended judgment, openmindedness, intellectual honesty, criticalness, and various other variables [43]

Sinclair and Tolman came to the conclusion that college training in science and mathematics did not, in their investigation, tend to make students "more logical, more reasonable, less affected by presuppositions and prejudices when considering common economic, political, social, and religious issues" [44]

[39] F D Curtis, "Some Values Derived from Extensive Reading of General Science," *Teachers College, Columbia University, Contributions to Education*, No 163, 1924

[40] O W Caldwell and G E Lundeen, "Changing Unfounded Beliefs — a Unit in Biology," *School Science and Mathematics*, 1933, Vol. 33, pp 394–413

[41] R M Zapf, "Superstitions of Junior High School Pupils, Part II Effect of Instruction on Superstitious Beliefs," *Journal of Educational Research*, 1938, Vol 31, pp 481–496

[42] E R Downing, "The Elementary Safeguards of Scientific Thinking," *Scientific Monthly*, 1938, Vol 16, pp 241–243

[43] V H Noll, "Measuring Scientific Thinking," *Teachers College Record*, 1934, Vol 35, pp 685–693

[44] J H Sinclair and R S Tolman, "An Attempt to Study the Effect of Scientific Training upon Prejudice and Illogicality of Thought," *Journal of Educational Psychology*, 1933, Vol 24, pp 362–370

The following have investigated, with positive results in general, the effect of special, direct training in mathematical reasoning Dailey,[45] Hall,[46] Lazar,[47] Parker,[48] and Fawcett[49]

Barlow found that specific lessons designed to give training in simple analysis, abstraction, and generalization led to improvement in apprehending and stating the "lessons" conveyed in fables[50] Salisbury obtained positive results from training in logical organization — analysis and synthesis, as applied to outlining and summarizing She reports that the program led to improvement in reading comprehension, general thinking, and reasoning ability[51] White found that a three-month period of training in logic, dealing chiefly with classification, inference, and affective thinking, resulted in improvement in habits of thought as reflected in scores on a reasoning test and in composition writing[52] Glaser has prepared and evaluated certain materials and teaching procedures designed to "cultivate a spirit of inquiry and to stimulate growth in ability to think critically," for intermediate grade, high school, and college students[53]

Final reference is made to a group of studies in the use, de-

[45] B W Daily, "The Ability of High School Pupils to Select Essential Data in Solving Problems," *Teachers College, Columbia University, Contributions to Education*, No 190, 1925

[46] E L Hall, "Applying Geometric Methods of Thinking to Life Situations," *Mathematics Teacher*, 1938, Vol 31, pp 379–384

[47] N Lazar, *The Importance of Certain Concepts and Laws of Logic for the Study and Teaching of Geometry* Menasha, Wis George Banta Publishing Co, 1938

[48] E Parker, "Teaching Pupils the Conscious Use of a Technique of Thinking," *Mathematics Teacher*, 1924, Vol 17, pp 191–201

[49] H P Fawcett, *The Nature of Proof*, Thirteenth Yearbook, National Council of Teachers of Mathematics New York Bureau of Publications, Teachers College, Columbia University, 1938

[50] M C Barlow, "Transfer of Training in Reasoning," *Journal of Educational Psychology*, 1937, Vol 28, pp 122–128

[51] R Salisbury, "A Study of the Transfer Effects of Training in Logical Organization," *Journal of Educational Research*, 1934, Vol 28, pp 241–254

[52] E E White, "A Study of the Possibility of Improving Habits of Thought in School Children by a Training in Logic," *British Journal of Educational Psychology*, 1936, Vol 6, Part III, pp 267–273

[53] *Op cit*

tection, and evaluation of propaganda Cited here are investigations by Biddle,[54] Jewett,[55] Lewis,[56] and Osborn[57]

Effect of examinations The question of the effect of examinations is treated more fully in Chapter XIII Suffice it to say here that the kind and rigorousness of the evaluation made of pupil achievement does, in all probability, have a good deal to do with the cultivation of the pupil's thinking processes No matter how clearly the objectives in the development of critical thinking are stated or how virtuously the instructional procedures are adapted to the objectives, there is a good chance that the major concern of many students will still be the mastery of detailed information without regard for its significance and application, if pupil achievement is assessed merely by the amount of such information remembered We cannot emphasize too strongly the premise that pupil achievement should be evaluated in respect to all the objectives of a course of study If the cultivation of the ability to think is one of the objectives, this objective should not only be assigned a place in the specific instructional procedure but the pupils should be held to account for this aspect of their development Pupils are led into undesirable habits of study by undesirable and inadequate testing practices Here we have an excellent example of the interrelationship between educational philosophy on one hand and educational measurement on the other[58]

[54] W W Biddle, "Teaching Resistance to Propaganda," *Seventh Yearbook, National Council for the Social Studies*, 1937

[55] A Jewett, "Detecting and Analyzing Propaganda," *English Journal*, 1940, Vol 29, pp 105–115

[56] R S Lewis, "Building Pupils' Defenses Through a Unit on Propaganda," *Clearing House*, 1938, Vol 13, pp 22–24

[57] W W Osborn, "An Experiment in Teaching Resistance to Propaganda," *Journal of Experimental Education*, 1939, Vol 8, pp 1–17

[58] F P Frutchey, "Testing for Application of Scientific Method," *Educational Method*, 1936, Vol 15, pp 427–432 E F Lindquist, in H E Hawkes, E F Lindquist, and C R Mann (editors), *The Construction and Use of Achievement Examinations*, Chapters II and III Boston Houghton Mifflin Co, 1936 E F Lindquist, *The Iowa Tests of Educational Development Use and Interpretation of the Test Results by the Classroom Teacher* Iowa City College of Education, State University of Iowa 1942 J B Stroud, "Evaluating Outcomes of Instruction," in C E Skinner and R E Langfitt (editors), *An Introduction to Modern Education* Chapter XV Boston D C Heath and Co, 1937 R W Tyler, "Ability

A hint to the student of education There may be some danger that our concern about the immediately practical in education and one of our other important objectives, namely the development of a faculty for critical thinking, may be at cross purposes A critical examination of outworn methods of teaching reading, for example, or of outmoded economic theories, may be of the greatest usefulness in the development of the mind, even though such knowledge in itself has a minimum of immediate social utility Indeed it is not uncommon to find in students of education something of an aversion to those mental activities which they are so anxious to secure in their pupils, namely critical thinking There are students who are so intent upon the discovery of some palliative or nostrum of immediate practical use that they become impatient of those inquiries into the history of their profession which alone seem capable of developing the type of educational literacy required for critical professional thinking If an outmoded practicum is wrong, it is wrong for certain reasons There is little profit, in so far as critical professional thinking is concerned, in knowing a theory is wrong unless the reasons why it is wrong are appreciated Moreover the acceptance of a theory or method as being unworthy of careful consideration merely because it came into being during the last century is an exercise in uncritical thinking We should have no fear of accumulating a surplus of knowledge

to Use Scientific Method," *Educational Research Bulletin*, 1932, Vol 11, pp 1–9 R W Tyler, "Measuring the Results of College Instruction," *ibid*, pp 253–260

CHAPTER VII

EMOTION AND FEELING THEIR ROLE IN BEHAVIOR

INTRODUCTION

Up until about the middle of the nineteenth century, roughly, psychology consisted of systematic discourse upon mind Dualism, centuries old, held sway Psychologically the nineteenth century is essentially one of psychophysiology The work of Gall, Flourens, Bell, Mueller, and others had established the causal dependence of consciousness upon physiological function For more than a quarter of a century following the founding of Wundt's laboratory at Leipzig (1879) the study of consciousness set the pattern in psychology While the psychologists of this period undertook to describe consciousness, they regarded it not as an entity *sui generis*, but as a product of physiological function [1] Theories of feeling and emotion have in general reflected changes in the main currents of psychological thought

EMOTION

The first perplexity that plagues the psychologist as he attempts to discuss emotion is the question of the phenomena that rightfully should be treated under that head Emotion is as difficult to define from a practical point of view as psychology itself, and for the same reason, namely, that the field is equivocal

Historically, psychological investigations have been made both of conscious phenomena and of behavioral phenomena Both are functions of living, semi-stable organisms Both are legitimate psychological data Neither is the cause of the other Both have their causal determinants in the protoplasmic interchanges of the organism One is as much a "ghost" as the other Some of those who have objected to behaviorism have

[1] See D Drake, *Invitation to Philosophy*, Chapter XX Boston Houghton Mifflin Co , 1933

done so on the ground that behavioristic descriptions have given no account of the causal antecedents This in a measure is true, but the difficulty is not, as these critics imply, owing to behaviorism's systematic position Were the nexus supplied they would be found to be neuro-muscular, not conscious states

The behavioral approach to psychology is now the prevailing one Fifty years ago psychology was largely a study of consciousness Theoretically one approach is as available as another

Historically, emotion has been treated as conscious states, as behavior, and as both In parallel with the history of psychology, the conscious aspects of emotion received major emphasis up to about 40 years ago As behaviorism and the objective methods of psychology prospered, especially as they were applied to animal and child study, interest began to center in the behavioral aspects of emotion The relationship assumed to exist between the conscious and the behavioral aspects of emotion is extremely difficult to trace historically At least since 1884 the role of the visceral and the vasomotor systems in emotion has been recognized Yet one writer may refer to these organic changes as the result of emotion, another as its antecedents, and still another as physiological accompaniments, leaving the identity of the phenomenon *emotion* to the reader's wonderment

Subsequent to the advent of behaviorism and to the launching of the experimental work in the field of emotion, largely upon animal and infant subjects, emotion came to be looked upon by several writers as *consisting of* organic changes, not as result, antecedence, or concomitance Thus Watson defines emotion as a " hereditary ' pattern-reaction ' involving profound changes of the bodily mechanism as a whole, but particularly of the visceral and glandular systems "

The question of the James-Lange theory The most important theory of emotion from a historical point of view is the James-Lange theory, formulated independently by James, an American psychologist, in 1884, and by Lange, a Danish professor of anatomy, in 1885 The details of the theory as stated by the two scholars are somewhat different, although

they are highly similar in basic principle In the words of James, "*the bodily changes follow directly the perception of the exciting fact, and our feeling of the same changes as they occur IS the emotion*"

The James-Lange theory has been relegated to the background in behavioristically oriented psychology This disposition of the theory was anticipated by Haitenberg at the turn of the century, who, while accepting the theory, regarded it as a theory not of emotion but as a theory of the consciousness of emotion [2]

Is the James-Lange theory vital to present-day theory of emotion? Has it been disproved? Outmoded? From the character of the literature within the last decade or so it is fair to say that the theory is not now vital to the treatment of the subject In view of modern interest in behavior, as reflected in the studies of animal and infant emotion, the theory has been to some extent outmoded Moreover, a considerable body of research, such as that conducted by Cannon and his students, raises certain serious objections to the status of the theory as a valid explanation even of the consciousness of emotion [3]

As is seen presently, the nature of the neurological connections is such as to render it unlikely that the visceral and circulatory changes could vary sufficiently to give rise to different states of emotion as subjectively experienced In the second place the glandular, vascular, and visceral processes involved give rise at any time to relatively little sensory experience In the third place behavioral studies show the pattern of response to be essentially constant, one emotional crisis from another Inasmuch as the James-Lange theory is addressed to the conscious aspects of emotion and assumes the existence of a variety of emotional experiences, the foregoing facts, if their complete validity be assumed, are almost fatal to the theory

Emotion as implicit behavior From the standpoint of implicit behavior, emotion features profound changes in the

[2] H M Gardiner, C Metcalf, and J G Beebe-Center, *Feeling and Emotion*, p 331 New York American Book Co , 1937

[3] See W B Cannon, *Bodily Changes in Pain, Hunger, Fear and Rage* New York D Appleton-Century Co , 1929

organism, especially those in the visceral, circulatory, respiratory, glandular, and skeletal muscle systems It is a part of the pattern that digestive activities stop Thus, emotion is in part the relaxation of tonus in the visceral muscles and the inhibition of the salivary and pancreatic glands Similarly, emotion consists in part in heightened tonicity of the skeletal muscles, in increased outpourings of certain glands, notably the liver and the adrenal and sweat glands, in an increase in heart rate and blood pressure, and in an increase in respiration

Not only is there acceleration in heart rate and augmentation in blood pressure, but there is also accomplished a transference of blood from the alimentary tract to the skeletal muscles and the central nervous system One of the most interesting aspects of emotion is adrenal secretion This fluid re-enforces the entire emotional pattern in that it exerts the same effect upon the organs involved as does innervation of the sympathetic division of the autonomic nervous system For example, stimulation of the splanchnic nerves, causing adrenal secretion, or injection of adrenalin, accelerates the heart and activates the liver, causing the latter to pour forth large quantities of blood sugar Adrenalin also promotes the coagulation of the blood, and allays the effects of fatigue The effect of adrenalin is also manifested in the tendency to tremble In addition to the foregoing glandular involvements there is in emotion increased activity of the sweat glands There is also the phenomenon of contraction in the capillaries of the skin, tending to cause the hairs to stand on end and to produce cold chills along the spine, and dilation of the nurses

(1) *Unity of pattern* Authorities have emphasized the unitary character of the implicit pattern That is to say, the pattern is brought into play as a unit, either by excitation from the sympathetic division of the autonomic nervous system or by direct action of adrenal secretion The pattern seems to be uniform with respect to *kind* in all emotional situations, although it doubtless varies in degree one occasion from another, depending upon the severity of the exciting situation

(2) *Universality of pattern* Not only is the implicit pattern uniform in character as it is called out within the same indi-

vidual from occasion to occasion, but it is also uniform from species to species In fact the pattern appears to be constant for all classes of vertebrate life The implicit emotional reactions of a cat, for example, are essentially the same as those of a man

(3) *The autonomic nervous system* The implicit pattern of emotion is under the control of the autonomic nervous system This system consists of three principal divisions, known as the cranial, sympathetic, and sacral Most of the internal organs are connected with the sympathetic division and one of the other two divisions, and the sympathetic division works in antagonism to the other two It arouses the pattern which is referred to as the implicit emotional reaction This division operates somewhat as a nerve net, a fact that dictates the uniformity of pattern and precludes differential action of the various organs involved in the pattern as the emotional situation varies

The cranial division is said to promote the building up and conservation of tissues, the sympathetic division, the quick mobilization and expenditure of energy, the sacral supplies the necessary nervous action for "emptying," as in elimination of bodily wastes and in reproduction For example, the cranial division constricts the irises, relaxes the skeletal muscles, increases the tone of the visceral muscles, activates the glands whose fluids are involved in digestion, and retards the heart On the other hand the sympathetic division dilates the irises, increases the tone of the skeletal muscles, relaxes the visceral muscles, inhibits the flow of digestive fluids, and accelerates the heart

(4) *Nervous center* The nervous center for the implicit emotional pattern is the thalamus rather than the cerebral hemispheres That the cerebral hemispheres do not serve as the neural center is shown by the fact that the pattern is not eliminated by the various types of injury or tumorous growth to which they are subject, and that decerebration in animals does not disrupt the pattern In fact brain injury and decerebration are known actually to lead to intensification of the emotional reactions On the other hand, elimination by surgical means of

crucial portions of the thalamus results in complete abolition of these reactions

In 1887 Bekhterev, as related by Cannon,[4] reasoned that the neurological center must be subcortical for the following reasons (1) emotion cannot be effectively inhibited by voluntary effort, (2) it may be evoked immediately after birth in the human infant, that is, before cortical dominance becomes effectively established, and (3) it is not abolished by decortication of animals[5]

(5) *Biological utility* The implicit pattern reaction promotes a speedy marshaling of bodily resources to the end that the organism is enabled the more effectively to meet sudden emergencies or crises in its career These reactions are induced automatically by the inciting stimuli which, following Bentley's usage, may be called the emotional predicament They are in no wise dependent upon volition It is a part of nature's economy that many of the bodily functions, those that are most vital to the well-being of the organism, are performed automatically, without training and without intention Such reactions are very old biologically and very stable "It has long been recognized that the most characteristic feature of reflexes is their 'purposive' nature, or their utility, either in preserving the welfare of the organism or in safeguarding it against injury"[6]

During the countless millennia before man attained the plane of civilized living, the predicaments or crises that provoked

[4] *Op cit*, Chapter XIX

[5] Subsequently Cannon and his colleagues have isolated the particular portion of the thalamus that performs this office In human subjects, Cannon relates, support of this conclusion is at hand from two sources, pharmacological and pathological In ether anaesthesia the cortical processes are abolished first In this stage emotional responses persist, although the patient is unaware of them Deeper anaesthesia does abolish the emotional reactions Upon the pathological side, it is observed in cases of hemiplegia that although the muscles of the paralyzed side of the face cannot be moved voluntarily, this side of the face may respond to emotional stimulation On the other hand, instances are known in which one side of the face remains motionless in emotional excitement but which can be moved readily by voluntary effort In such instances lesions have been discovered in the thalamus

[6] Cannon, *op cit*, p 194

strong emotion called for supreme muscular exertion The same condition prevails today in wild animal life Cannon cites evidence of the utility of increased liberation of blood sugar in the sustained muscular activity required for meeting emergencies It is known that glycogen is stored up in muscles and that it is depleted in exercised muscles Depletion of glycogen or reduction in the sugar of the blood lessens the ability of muscles to do work Emotion is biologically very old and the physiological pattern in civilized man is probably identical with that of the Java Man and Peking Man who roamed the plains of Asia a half-million years ago It is in the light of this consideration that the biological utility of emotion should be reckoned This consideration gives meaning to the various bodily changes under consideration The utility of increased respiration and heart action in supplying oxygen and combustive material and in discharging carbon dioxide and of heightened tonicity of the skeletal muscles is likewise indicated

(6) *Sources of energy* Nor is emotion without utility to the men of today The astounding energy that may be displayed during periods of great emotional excitement and the extraordinary endurance that may be exhibited have been a subject of admiration long since The literature pertaining to the exploits of the gladiatorial arena, of the battlefield, and to the supreme endurance of the frenzied participants in the ceremonial dance or of the antagonists in the "battle of wager" abounds in feats of strength and endurance that, amazing though they be, seem plausible and verifiable from experience. In his excellent paper, "The Energies of Men," James writes that "as a rule men habitually use only a small part of the powers which they actually possess and which they might use under appropriate conditions" [7]

Elsewhere he comments upon the "reserves of energy" that are rarely called upon but which may be tapped, as it were, by those who energize at a deep level In his somewhat typical moralistic vein he writes, "More of us continue living unnecessarily near our surface" Or, "In rough terms we may say that

[7] W James, *Memories and Studies*, p 237 New York Longmans, Green and Co, 1911

a man who energizes below his normal maximum fails by just so much to profit by his chance at life, and that a nation filled with such men is inferior to a nation run at higher pressure" [8]

Our chief concern at the present is in the magnificent heights to which an individual can drive himself if the tide of emotion runs sufficiently strong The exploits of John Colter as cited by Cannon emphasize the heights that human exertion and endurance can attain when individuals are induced to extend themselves to the utmost Colter and his companion, while traveling in Montana in the early days, were taken captive by a band of Indians Colter was stripped of his clothing, his companion who resisted was killed and hacked in pieces Colter was then made the subject of a sporting event He was induced to set out across the prairie Looking back he saw the young warriors preparing for the chase Now he knew that he was to run a race for his life He launched forth on the business at hand "with the speed of the wind" The war whoop arose, and a large company of young warriors, with spears, followed in rapid pursuit "He ran with all the speed that nature, excited to the utmost, could give, fear and hope lent a supernatural vigor to his limbs, and the rapidity of his flight astonished him" After running some three miles his strength began to fail him Stopping and looking backward he observed that only one of his pursuers was near The latter rushed upon him, attempted to cast his spear and fell Colter seized the spear and with the help of this instrument dispatched his adversary to the happy hunting ground and set out again "With renewed strength, feeling, as he said as if he had not run a mile" [9]

In religious manias that have sometimes swept the country, in tribal ceremonial, and sometimes in religious revivals we find wonderful exhibitions of strength and endurance Men and women dance and sing with all their might for hours on end, frequently culminating in a frenzy nothing short of madness Some of the participants swoon or go into writhing contortions, or gnash at objects with their teeth In revivals in southern highlands the author has seen women shout and dance with astounding fury, and end the maniacal performance in a swoon

[8] *Ibid*, pp 233–234 [9] Cannon, *op cit*, p 227

which left them pale and faint Wesley writes of some of the meetings he addressed that "Some were torn with a kind of convulsive motion in every part of their bodies, and that so violently that often some four or five persons could not hold one of them" [10]

At our more normal levels of performance, after a moderate outlay, mental fatigue is adequate to reduce output or to inhibit further activity altogether Under normal conditions of motivation the disagreeable character of fatigue serves to protect the tissues and to prevent extreme exhaustion Under the impelling forces of supreme motivation, such as that which activated John Colter, the inhibiting influence of mental fatigue is nullified, as it is under the excitement of the ceremonial dance

The question of depressing emotion The foregoing discussion of emotion and the inferences as to its biological function apply to the exciting emotions or, as they are sometimes styled, the great emotions — fear, rage, and sex emotion There is another type of behavior in which persons are profoundly *moved,* but not excited, namely sorrow and grief Not a great deal is known about these depressing emotions organically, owing partially, perhaps, to the fact that they are not present in animals nor in infants, the two sources of most of our knowledge of emotion

It is reported that the pulse rate and blood pressure are depressed, and that breathing is slow and irregular There is also a marked reduction in oxygen intake and CO_2 exhalation [11] It seems likely that in some of its most important aspects depressing emotion behaves physiologically in a manner opposite exciting emotion, although not completely so, for loss of appetite and general disturbance of the digestive processes appears to be common to both

Overt behavior Organisms respond overtly to the various emotionalized predicaments that confront them It is assumed that in animal life the overt responses are instinctive in character, and that in man they are learned learned in so far as

[10] *Ibid*

[11] G Dumas, *Nouveau Traite de Psychologie,* Vol 2, pp 383 ff Paris Felix Alcon, 1932

they are patterned and adaptive [12] When unlearned, as in the infant, they are quite diffuse and unadaptive The overt responses, whether learned or unlearned, patterned or diffuse, are energized by the implicit responses just described

Language usage suggests that bodily postures, ocular attitudes, and facial expressions are signs by which we may know the quality of emotion One, so our languages teaches, is pale in fear, flushed in anger, or stands in wide-eyed wonderment before an awful situation By analogy, the adjectives we use in describing physiognomy, as steel-grey eyes, piercing blue eyes, dark, dreamy eyes, square jaw, suggest personality traits The language value in such manner of description is of course considerable, but we should not be led to suppose that it is anything other than a tool of communication Actors and artists have educated us to believe certain bodily expressions and tonal inflections are unfailing signs of the quality of emotion They make use of conventionalized symbols of expression, and these are very necessary to their art Moreover, their value in communication is not lessened by their being nothing more than conventional signs

Careful scrutiny of pictures taken of infants and of adults as they were subjected to a wide range of intense emotional stimuli has failed to reveal any trustworthy symptoms with respect to kind of emotion Upon the basis of a critical analysis of photographs of facial expressions taken during moments of emotional excitement, Landis concludes that "there was no expression typical of any situation in this experiment Nor was any expression typically associated with any verbal report given in this experiment" [18]

We may assume that the actor or singer is able to portray emotion in tonal inflection, facial expression, and in gesture because there exists a language of the stage through the medium of which emotion is portrayed to all who understand the language This fact does not imply that in real life emotion is

[12] M and I C Sherman, *The Processes of Human Behavior,* Chapters V and VI New York W W Norton and Co , Inc , 1929

[18] C Landis, "Emotion II The Expressions of Emotion," in C Murchison, *Foundations of Experimental Psychology,* Chapter XIII Worcester, Mass Clark University Press, 1929

similarly expressed The situation is somewhat analogous to that which obtains in music Certain musical themes come to be associated with certain subjects and signify these subjects to those who are musically sophisticated, but have no necessary inherent association with the subject

Emotional experience Careful description of emotional experience by competent observers is lacking in psychological literature In all probability the emotional experiences of adults are not simple, elementary, and irreducible, but are highly complex organizations of primary and secondary data Within the last two decades writers have generally followed Watson in the recognition of three primary emotions, fear, anger, and love According to this procedure there are assumed, by some writers, to be three primary, elemental, unanalyzable emotions given in nature

Watson, let it be recalled, was speaking of the behavioral, not the experiential, side of emotion, and with respect to behavior he has been disproved Even had he been vindicated, there would be inferential reasons only for the assumption of three elemental qualities of emotional *experience* [14]

One may experience (perceive) general bodily tremor, ten-

[14] The problem at issue is whether or not there are any elemental, unanalyzable qualities of emotional experience If not, the question of primary emotion loses all importance If such there be, in whatever number, each should have its own locus in the brain, just as seeing, hearing, and other senses have From the data on brain pathology it seems pretty clear that the loci are not in the cerebral hemispheres

Cannon (*op cit* Chapter XIX) and others have argued for a thalamic origin of emotional experience, that is, that the particular *quale* or aura of fear, love, rage, etc is owing to the excitation of particular and appropriate areas of the thalamus To the writer there seems to have been a tendency to take the evidence of the localization, in the thalamus, of feeling by one of its definitions, affection — pleasantness and unpleasantness — as proof of the localization therein of feeling by another of its definitions, emotional experience, as love, fear, and anger

Cannon, Head, and others have argued for the presence of an affective center (center for pleasantness and unpleasantness) in the thalamus, and, indeed, some bit of supporting evidence is brought forward We have already seen that the neurological center of the implicit emotional responses is in the thalamus It is certainly logical to assume that the thalamus is also the locus of elemental emotional experience However, it is to the discovery of the locus that we are looking for proof of the *existence* of elemental emotional experience

sion in the skeletal muscles, and respiratory agitation More importantly, the arousing predicament is affectively perceived. There follows the perceptual act, an impelling desire — desire to annihilate, to escape, or to have and to hold, depending upon the manner in which the predicament is perceived Indeed it is possible that the nature of the quality of the perceptual act and the aroused desire are in themselves sufficient to give an emotional experience its particular aura The judgmental theory of feeling, as propounded by Carr, is capable of being extended to cover the *quale* of emotional experience[15] The theory assumes that pleasantness and unpleasantness — the two qualities of feeling — are attributes we ascribe to objects by reason of our normal reactions toward them. By an extension of the theory we may equally well ascribe our experiences of fear, anger, and love, and others to our normal reaction tendencies toward the stimulating situations Until and unless the loci of the several varieties of emotional experience are discovered, we are under no particular necessity of assuming that the specific emotional coloring is due to the excitation of a special area in the brain that has the mediation of this coloring as a special function

Emotional control A socially successful person learns to exercise a certain amount of control over his outward emotional expression, including his speech and gesture In so far as the implicit emotional pattern is concerned the only aspect that can be voluntarily inhibited is the heightened tension of the skeletal muscles Even so, an individual learns to manage his emotional life in various ways In many situations he is able to escape an emotional seizure through the expediency of a socially graceful response One's emotional reactions, especially his speech and gesture, tend to have the same effect upon himself as they do upon his audience A happy response pleases his listeners or spectators and allays their tensions, and, incidentally, affects him similarly Much of our social embarrassment arises from an inability at the moment to make a socially acceptable response For example a lad is normally the object

[15] H A Carr, *Psychology*, pp 290–299 New York Longmans, Green and Co, 1925

of considerable teasing at the hands of his fellows He is accused of having a girl or of being a "sissy" The emotional value of these stimuli is derived in part from his lack of socially graceful means of responding to them Thus from the standpoint of managing socially undesirable outbursts a highly effective expediency is the substitution of non-emotional responses for emotional ones When the character of the response changes, the meaning of the stimulus also undergoes change

There prevails a point of view that it is undesirable from the standpoint of mental hygiene to suppress emotion This teaching has in it elements both of truth and error The quickest and most effective way to reduce emotional tensions is to leave them alone, to get one's mind off the subject and engage in something else Emotion subsides spontaneously and rather quickly if there is no recurrence of the provoking circumstance or no symbolical revival of it There are, to be sure, instances in which "having it out" leads to a speedy reduction of emotional tensions and in which bearing one's emotion in silence leads to prolongation and recurrence of the tension But this is because "having it out" leads to a happier adjustment to the provoking circumstance, not because the tensions are worked off so to speak in the sense that the letting off of steam relieves the tension in a boiler

There is another aspect of emotional control or, more happily, emotional adjustment that is of greater consequence in mental hygiene than the control of normal emotional outbursts namely, excessive indulgence in emotionalized thinking This is seen in brooding over misfortune, and in continuing trains of thought addressed to one's hard treatment by another, to rivalry, jealousy, malicious machinations, and faithlessness — trains which frequently have their origin in feelings of insecurity A person can do much in the way of controlling these tendencies simply by inhibiting them as they arise A more lasting and desirable remedy is found in the making of adjustments of a more fundamental character These, alas, are often difficult of achievement

If by emotional suppression is meant the inhibition of temper tantrums and violence, such a form of control is at least harm-

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less If suppiessıon ıs keepıng some emotıonal cvent a secret as when, owıng to shame oı a sense of guılt, the ındıvıdual ıs pıevented fıom ıelatıng the ıncident oı fıom ıecallıng ıt ın a normal way, suppıessıon may be ıegarded as ınadvısable The theıapeutıc value of ıelatıng dıstuıbıng ıncıdents to sympathetıc frıends has long been ıecognized

Fınally, a woıd may be added ıegaıdıng sex dıffeıences ın emotıon It ıs commonly saıd that women aıe moıe emotıonal than men An extensıve ınvestıgatıon conducted by Stıatton supports thıs popula ı belıef wıth ıespect to feaı but not wıth ıespect to anger [16] At least women admıt to moıe feaı As Fıeldıng has saıd, the lady who shrıeks at a mouse may be capable of poısonıng heı husband Peıhaps the explanatıon lıes not so much ın any constıtutıonal dıffeıence as ın the fact that women have a socıal lıcense to be afıaıd as often as occasıon may arıse It ıs not unwomanly to be afıaıd, ıt ıs unmanly On the otheı hand men and women alıke may become angıy upon appıopııate occasıons wıthout loss of status

FEELING

The teıms *feelıng* and *emotıon* aıe often used ınteıchangeably both ın popula ı and ın psychologıcal wııtıng, and such usage ıs justıfied by the dıctıonaıies In psychologıcal wııtıng ıt ıs dıfficult to obseıve a stııct dıstınctıon between them even when made One souıce of dıfficulty lıes ın the fact that there ıs no adjectıve for feelıng, and the adverb ıs raıely used Hence one ıesorts to the adjectıve *emotıonal* or *emotıonalızed*, as ın the phıase *emotıonalızed attıtudes* The adjectıve *affectıve* ıs sometımes used, but ıt ıs equıvocal owıng to the fact that ıt descrıbes both feelıng and emotıon and lacks a ıecognized veıb foım Moreover the desıgnated phenomenon ıs often equıvocal Eveıy emotıonal predıcament aıouses stıong feelıng ın addıtıon to emotıon

In ıts stıct psychologıcal usage feelıng means pleasantness and unpleasantness These are geneıally regaıded as the posı-

[16] G M Stratton, "The Relation of Emotion to Sex, Pıimogenıture, and Dısease" *American Journal of Psychology*, 1934, Vol 46, pp 590–602

tive and negative phases of a single variable In addition to feeling, this variable is known by such terms as *feeling tone* and *hedonic tone*

We may assume the existence of two primitive conditions, *pleasure* and *displeasure* These two qualities are given in nature and may be aroused by appropriate stimulation Let us assume further that *pleasantness* and *unpleasantness* as psychological categories are abstractions They are generalizations based upon numerous agreeable and disagreeable experiences A judgment that a sense impression is pleasant or unpleasant may be merely a generalization based upon the normal reaction tendency toward it [17]

The function of feeling Feeling is thought to be very primitive biologically Authorities have suggested that it was the first form of consciousness to make its appearance as life moved from plant to animal forms According to this suggestion, organisms were able to react to agents as agreeable and disagreeable stimuli before any of the specialized sensations, such as smell and taste, were evolved It has been suggested that the special senses represent differentiations of the primitive qualities of feeling Quite aside from the question of priority it seems likely that pleasure and displeasure are biologi-

[17] The leading theory of feeling is the elemental By this theory pleasure and displeasure are given status corresponding to that occupied by sensation, namely primary, unanalyzable, elemental data of consciousness — something given in nature

At its inception the elemental theory drew support principally from logical necessity It was observed that feeling does not behave like sensation For example, clearness is an attribute of sensation, but not of feeling Close attention to a sensory process enhances its clearness, pleasantness and unpleasantness tend to disappear when they become objects of attention A more fundamental condition to the elemental status of feeling is that it have a special center in the nervous system As is seen above, Cannon and Head interpret certain clinical data to mean that there is such a neural center and that its locus is the thalamus

Since feeling does not attend all experiences, but only some of them, it is necessary to assume that an experience, for example a visual sensation, will be attended by feeling only in the event the nervous impulses set up by the action of the sense organ go to the feeling center in addition to the appropriate sensory center A sensation, an image, or train of thought is presumed to be affectively toned if (and because) the nervous impulses spread to the affective center There appear to be no neurological difficulties in such an assumption

cally very old, antedating the evolution of intelligence to a plane where it could function as a determining factor in conduct

When we examine the senses that are most vital to the organism's life — taste, smell, pain, heat and cold, hunger and thirst — it becomes obvious that they are the very senses with which pleasure and displeasure are most intimately associated Bodily requirements are met by reason of the disagreeable character of sensation of hunger and thirst and the agreeable character of the sensations associated with eating and imbibing Animals also have additional requirements with respect to rest, sleep, and integrity of tissue Only highly intelligent beings like members of the human species could foresee the consequences of mutilated tissue, of the loss of blood, or of protracted insomnia

The reflexes "take care" of the organism in many ways, supplying oxygen, assimilating food, distributing fluids, eliminating waste, and to some degree conserving tissue, as in the flexor and extensor reflexes of the skeletal musculature These functions are involuntary, they must go on prior to learning or the development of intelligence sufficient for their voluntary execution

In a similar manner pleasure and displeasure serve the biological needs of organisms A fundamental condition of pleasure is that organisms continually enhance and prolong the inducing activity or function A fundamental condition of displeasure is that organisms desist from the activity or avoid the agency generating it Pleasure and displeasure are closely associated with those functions that foster the welfare of the individual and the continuance of the species

(1) *Feeling in human behavior* Discussions of relationships between pleasure and displeasure and human living are centuries old In the main, the ethical implications have been emphasized Historically the paramount issue has been the question of the place feeling *ought* to have in a good life The student of ethics or of the classical languages is familiar with the ancient disputations upon this issue Some, the Epicureans, held the greatest good to lie in the attainment of

pleasure and in the avoidance of pain or displeasure, others, the Stoics, held feeling to be contrary to nature and therefore something to guard against constantly lest man be influenced by it rather than by reason

Authorities may disagree upon the *proper* sphere of influence of feeling, but there is no doubting that it plays a dominant role in the lives of all men, exerting a determining influence upon their attitudes toward nearly all important questions Just as it was said that emotion energizes behavior, so it may be said that feeling directs it Reason may convince men of the logic of a course of action, but they *act*, make personal sacrifice, when the issue matters to them personally One may be convinced of the rightness or wrongness of an act of aggression upon the part of a nation He may reach this decision in the light of a kind of international code of ethics He is willing to assume some responsibility for doing something about it only if he strongly dislikes the aggressor and is incensed by his ruthlessness or is deeply sympathetic with the oppressed nation

So far from there having been any abatement in feeling in the life of man in virtue of his vast intellectual attainments, its importance is magnified a thousand fold Indeed, feeling is the impetus to his intellectual conquest A few examples will serve to illustrate the scope of feeling in man's life and to show how much beyond the sensuous pleasures and displeasures of his animal being his affective development has gone We shall use as examples Locke's suggestions for "the most lasting pleasure of this life," namely

1 Health — 'without which no sensual pleasure can have any relish"

2 Reputation — "for that I find everybody is pleased with and the want of it is a constant torment"

3 Knowledge — "for the little knowledge I have, I find I would not sell at any rate, nor part with it for any other pleasure"

4 Doing good — "the good turn I did yesterday, a year, seven years since, continues still to please and delight me as often as I reflect on it"

5 "The expectation of eternal and incomprehensible happiness in another world"

(2) *Ach's laws of feeling* Feeling and desire are inseparable Desire implies satisfaction on account of attainment To be pleased by the nongratification of something which is desired does not make psychological sense These relationships are aptly expressed in Ach's laws of affection, formulated in 1910

(1) If realization occurs in accordance with the determination (desire), there results as a rule a pleasant feeling

(2) If, on the other hand, the realization does not occur in accordance with the determination, that is if failure is experienced, there usually results an unpleasant feeling

(3) The stronger the determination, the stronger are, as a rule, the resulting feelings

(4) The stronger the resistances which oppose the determination, the more intense the resulting feelings

(3) *Feeling and reason* Feeling is implicated in much of man's rational endeavor, implicated both in the process and in the result Reasoning is a process of weighing facts, issues, arguments, assumptions, etc, with the view to reaching a conclusion But here there is no objective standard of weights They weigh in proportion to their personal worth In impersonal matters like problems in mathematics or the mood and tense of a Latin verb, rational processes may be attended with comparatively little feeling, beyond that which normally attends success or failure in motivated activity However, when we come to such matters as the choice of a career or child labor legislation, feeling gives weight to the arguments and is implicated in the conclusion

We are under two great masters, pleasure and pain, it is for them alone to determine what we ought to do — Bentham

SOME EDUCATIONAL APPLICATIONS

"By emotion I understand the modifications of the body by which power and action is increased or diminished, aided or restrained" — Spinoza [18] It is significant educationally that

[18] After T H Briggs, *Secondary Education*, p 394 New York The Macmillan Co, 1934

competent social behavior is quite as dependent upon the proper education of feeling and emotion as upon the proper education of the intellect Indeed our educational systems do contribute enormously toward the education of the affective life of the pupil and as such they prepare him for dependable citizenship, but by and large this education is provided with the left hand, while teaching with the right that knowledge not feeling and emotion should be the basis of action Here the writer has no lesson or moral to draw, for it appears that the affective life of the pupils is cultivated rather well, even if not purposefully done Our literature, history, song, art, statuary, our taboo, folkways, mores, and social sanctions, create loyalty toward our institutions and their symbols They determine loyalties and antipathies toward nearly all the issues of social life The only plea here made is that we recognize frankly that this is what they should do No amount of knowledge alone can make a good citizen, a good parent, a good Catholic or Jew Feeling is part of the man

The character of a man is represented quite as much by his affective reactions to the several social situations in his life as by his knowledge and skill The character and indeed the safety of a nation lie, in no small degree, in the emotional reactions of its people We teach that education is measured by the change it effects in behavior An educational program that leaves the cultivation of the affective life of the pupils to caprice is not in a position to make the most of its opportunities

Instruction Receptivity to an item of instruction depends in part upon the logical character of the facts presented and in part upon the emotionalized attitudes of the pupils In gaining the acceptance of a point of view a teacher may have to combat hostile attitudes toward that point of view In a democratic society in which education aims to cultivate free, responsible thinking, the teacher is also concerned with over-sympathetic attitudes As Briggs has said, sympathetic listening and reading may be as prejudicial to sound conclusions as hostile listening and reading are In terms of existing emotionalized attitudes, hostile and sympathetic, we can understand how the same facts, presented under the same circumstances and to

equally intelligent persons, can lead to such widely divergent conclusions

Biases do not necessarily yield to facts Nor is it likely that much good will come of our exhortation to pupils to think and to follow the evidence When reason and feeling come into conflict, one or the other stands to be altered, and perhaps it is reason as often as feeling The most successful method of combatting feeling in such matters is with feeling Could we build up emotionalized attitudes against hasty, ill-considered action, could we make pupils ashamed to take positions without sufficient evidence, and could we by social approval reward them for delay, investigation, and intellectualization, we could harness for educational purposes a great and dynamic force

It should be kept in mind that education in a free society proceeds quite differently from that in a totalitarian state In the latter, the school, the press, the radio, and even the church and the home are committed by edict to the propagation of the prevailing ideology Such a state prospers on dogmatism and prejudice In a democratic state it is not the duty of education to suppress emotion and feeling, but to direct them along different lines There should be no question of patriotism and loyalty to the state, for if they are undermined, the state is doomed, social sanctions and rewards should be used to lead pupils to self-reliant, intelligent, and loyal citizenship In this process feeling and emotion are requisite, but they should not be used to gain the acceptance of superimposed dogma They should be employed in a service which they alone are capable of performing urging citizens to work, think, and act in the best interest of the people

Motivation In school as well as elsewhere the most important motives are the wants and aspirations of the individual Our schools have done a great deal within the last two or three decades to make school life interesting and vital The accumulation of interesting books, exercises, and activities has served to remove schooling from the category of unpleasant tasks The social utility theory of education has doubtless contributed to the movement This is all to the good, but we should not lose sight of the fact that a pupil has wants that are probably more

real and vital to him than the prospect of becoming a successful citizen when he grows up In casting up sums in arithmetic it is unlikely that he is concerned overly much with the thought that when he is a man he may need to compute compound interest, purchase a refrigerator on the installment plan, or serve on the board of tax assessors His arithmetic projects in school are a means of satisfying more immediate and more vital, if less tangible wants, namely a sense of security Here, success in large measure is symbolic

What are the basic aspirations of every normal pupil? Perhaps it is safe to say that the mastery of subject matter in and of itself is not among them Mastery of subject matter is a means to an end — not a social end, but an end of triumph in a social situation, an end of personal satisfaction Thomas's celebrated four wishes are illustrative, namely *recognition, security, response from others,* and *desire for a new experience* [19] These are among the most important aspirations that school enterprise can satisfy It is also likely, when repeated failure is encountered by a pupil, that the source of dissatisfaction lies in some such aspirations as those suggested by Thomas, rather than in his anticipation of getting worsted by a sharp trader or of being embarrassed by not knowing who conquered the Gauls or where Cape Town is when he grows up

Much of the satisfaction that comes from successful accomplishment in school is ego gratification Success in gaining knowledge and in mastering the content of the curriculum and failure in doing so are in a degree symbolic Success is a symbol of competence, failure, a symbol of defeat From early life a pupil becomes conditioned positively toward success, such that it is ever afterward a source of satisfaction to him Simultaneously he becomes negatively conditioned toward failure It is inevitable that he do so, because success by definition means the gaining of some desired end — a pleasurable outcome, and failure, the non-gratification of a wish — an unpleasurable outcome These two statements are inferable from Ach's first and second laws of feeling (which see) From his

[19] W I Thomas, *The Unadjusted Girl,* p 4 Boston Little, Brown and Co , 1928

third law (the stronger the determination, the stronger the resulting feelings) we get the idea that in school, particularly in the elementary school, where social sanctions are strong, success and failure touch the most basic motives of human existence It should also be remembered that success and failure, from the pupil's point of view, are not absolute, but relative to his level of aspiration Repeated failure is detrimental from the standpoint of motivation Fortunate is the teacher who can succeed in adjusting a pupil's aspiration to his ability, to the end that he may have an opportunity for self-expression and ego gratification in curricular and extra-curricular activities, commensurate with his ability

In our efforts to entertain and appeal to the interest of our pupils we have sometimes overlooked the fact that some of the old educational virtues for example, pride in a task well done, have much to commend them from the standpoint of motivation Herbart's assertion that "The glow of triumph over difficulty may bring interest to the driest subject" is apropos, as are also Locke's pronouncements on "love of credit and apprehension of shame and disgrace" (*cf* Chapter XI)

Were it not for an unfortunate practice among educational writers of prefacing new teachings with a damning of the old ones, the cleavage between the sentiments expressed by Locke and Herbart and those prevailing today should not have occurred All of the educational advantages of enriched, vitalized, interesting curricula could be realized without giving the pupil to understand that he is not expected to do anything he does not wish to do There is such a factor in life as pride in meeting one's obligations There is something to be said for pride in a task well done, and for satisfaction in doing the best one can Full use can be made of these factors without at the same time showing any less concern about providing interesting and socially valuable activities [20]

[20] *Cf* J E Anderson, "The Relation of Emotional Behavior to Learning," *The Psychology of Learning, Forty-first Yearbook, Part II* National Society for the Study of Education Bloomington, Ill Public School Publishing Co , 1942

Cultural factors The impact of cultural factors upon the affective life of a people is of considerable educational importance We have already seen (Chapter III) an outstanding example of the influence of cultural factors in racial attitudes A less spectacular, perhaps, but equally important instance is found in the feelings of patriotism and loyalty on behalf of one's flag and country, and in our sympathies and antipathies toward nations, ideologies, and causes We have also seen how parental attitudes are influenced by prevailing cultural patterns All of which is to say that learning, as dictated by tradition and culture, influences the operation of the affective processes in the life of man

The kind of food people eat, the manner in which it is served, the table cloth, the silver, the flowers on the table, and numerous other factors associated with eating are primarily of aesthetic value and have little to do with the satiation of primal appetite, and this aesthetic value is of cultural origin Things considered in good taste in one society may be bad taste in another In China one shows his appreciation of tasty food by making much noise in the eating The Zulus' liking for hot blood and other peoples' taste for viscera, the eyes of salmon, spoiled meat, and insects seem revolting to us Existing habits seem good and natural, others, to the extent that they deviate from our own, seem queer, unnatural, or actually repugnant These habits — folkways, cultural patterns, etc — once formed, take on the characteristics of emotional complexes

Some groups have been taught to bear pain stoically, and sometimes appear to reach a point where prolonged pain may bring personal satisfaction Among some elements in our own culture there has been some objection to the use of anaesthetics in childbirth on the ground that it is immoral to alleviate pain during the process — suggesting an attitude of holiness in the suffering

In our culture, marriages among close relatives is frowned upon Yet it is only our culture that stands in the way of the practice, disregarding, of course, the possibility that advanced peoples might refrain from consummating this kind of union on the ground of biological undesirability (In any case the prin-

cipal determinant is not biological It simply is not socially acceptable) Brother-sister marriage was generally practiced by the ancient Egyptians, as it has been in other societies This practice, which seems so unnatural to us and worthy of severe punishment, might well seem perfectly fit and proper were it rewarded with social sanctions

Ideas of beauty vary from one culture to another In some, fat women are preferred to all others Deformation of the body, beauty scars, artificially elongated necks, enlarged lips, and pointed teeth are well known, to say nothing of the effects produced by head-flattening and also by the modern girdle In our less critical moments we are likely to think that there are a lot of people in the world who do not know how to act like human beings In our more serious reflections we must realize that anything is human that typifies the behavior of human beings There are no other standards of humanity In any event we cannot understand the behavior of peoples of different culture in terms of our own system of values, but must seek explanations in their own cultural histories

CHAPTER VIII

PERSONALITY AND ADJUSTMENT

Education enables individuals to achieve adjustment to an increasing number of problems It also creates problems, and this is what it should do Mental growth may be envisaged as increased facility in adjustment at successively higher levels The goal of education is not successful adjustment, but successful adjustment to a greater range and complexity of problems Illiterate people are probably as well adjusted, if by adjustment is meant an absence of emotional turmoil, as highly cultivated people Mental development takes place as pupils learn to adjust to an ever growing array of problems

The subject of personality and adjustment is of interest to educators on several counts. The emphasis that has come to pass upon making our schools lifelike and the schools' acceptance of the responsibility for the development of every educable aspect of the pupils' development give the problems of personality development and personal adjustment a place of first importance More and more, teachers are coming to realize that academic learning is affected by such factors as pupils' emotional, social, and home adjustment Most of all, personality and adjustment are forms of behavior — educable behavior They are learned The school can teach them, not formally, perhaps, as it teaches reading or number, but by providing a healthy and stimulating social environment and inculcating desirable behavior patterns with respect to it

The great moving forces in human life are feeling and emotion They are the mainspring to mental development and man's achievements and also the source of his mental ills Human problems stem from the emotional life of man (Since there is no adjective for feeling, we shall use the adjective *emotional* to include both emotion and feeling) Emotional disturbances make for good and evil While it is true that many children are oppressed and overwhelmed by such disturb-

ances, many others find them a healthy stimulus and a means of growth

ADJUSTMENT AND MENTAL DEVELOPMENT

Breathing itself is a series of highly localized adjustments to a highly localized set of bodily conditions All animals have the power of making adjustment In some of the more lowly forms these adjustments are as simple as the reflexive adjustments of our bodies Human adjustments range in complexity all the way from these primitive forms to all those myriad reactions by which status and self-respect are maintained It is with the latter sort that education and psychology are chiefly concerned

The educational significance of adjustment lies chiefly in the fact that as individuals have recourse to various modes of achieving and maintaining adjustment those modes of adjustment tend to become a part of the person Thus timidity and diffidence which we see as marked characteristics of some people may be thought of as a culmination of behavior tendencies established in consequence of resorting to modes of adjustment of that character in the past, and, therefore, as learned behavior Park and Burgess have recognized four classes of tendencies in social situations to withdraw, to approach, to dominate, and to yield We need not for present purposes concern ourselves with the merit of this classification It is sufficient to recognize that individuals do display certain behavior tendencies with sufficient regularity to permit us to look upon these tendencies as being characteristic of them The personality traits of an individual are in part, perhaps in large part, those traits that typify his manner of maintaining adjustment — his reactions to frustration

The school's obligation with respect to the problem at hand is not met fully by protecting the pupil from all emotional disturbances It is not self-evident that this would be a wise course even if it were capable of fulfillment It is admitted that school life is overly stern for a considerable percentage of the pupils The point advocated here is that the school has not fully discharged its responsibilities with respect to personality and ad-

justment when it has provided certain emotional safeguards A more positive program is required Many pupils come to school in a maladjusted condition Circumstances outside the school may lead to maladjustment We may reduce the problem by removing some of the obstacles frequently found in school But along with this should go a broad, positive program The latter assertion is made upon the assumption that personality and adjustment are learned and can be taught

An adequate personality, by one standard, is one that can withstand hard knocks By this standard, a pupil requires a certain amount of tempering Naturally, this can be overdone, and in the case of less hardy souls is likely to be overdone simply because we do not know how to shield the pupil from all the rigors of school life But at the same time it is not to be taken for granted that every element of school life that disturbs a child emotionally or leads to frustration represents educational malpractice Pupils are being trained to live in a tough, competitive world

The number of children who are maladjusted — who have not weathered the storm — is great An environment that is of about the right degree of sternness for some is likely to be too harsh for others It is always a question as to how much a given pupil should be protected from the vicissitudes of school life and how much he should be helped to make successful adjustment to a fairly stern environment

In education our contributions to the building of a "soft" generation are as much to be feared as are our contributions to maladjustment Perhaps the only thing that has kept us from swinging too far in the direction of overprotection, under the guiding educational philosophy of the past few years, is the fact that we have not known how to implement this philosophy completely

FACTORS UNDERLYING PERSONALITY

Our concern is chiefly with those factors that relate to motivation Locke put his finger on one such factor in mental development in his asseveration that love of credit and apprehension of shame and disgrace are of all others the most powerful in-

centives of the mind Bain appears to have had the same idea in mind by his use of the term *self-esteem* To the same purpose McDougall has employed the term *self-regard* Once the ego emerges it is defended at considerable cost, it becomes one of the things meant by self-preservation Then failure to gratify our wishes may mean something more than simple displeasure, it may threaten self-preservation in the sense of loss in self-esteem, in ego security

Level of aspiration The operation of the principles of self-preservation is seen in the goals individuals set for themselves — their levels of aspiration — and in the nature of their competitive activities Thus Allport suggests that adults, when asked to state a goal in the presence of an audience, commonly place their goals not so high as to make failure and consequent embarrassment highly probable, nor so low as to prevent their taking pride in their accomplishments [1] In level of aspiration experiments a subject is typically asked to state his goal and subsequently exhibit his performance in the presence of others However, a person's pride may be at stake even in matters that are obscured from social inspection, and the same principles are probably operative to a degree as he undertakes a task worthy of himself and is elevated or downcast as he succeeds or fails in accordance with his aspirations

Undoubtedly individual differences in such matters are great Just as there are persons who find security only in insecurity — who are satisfied with themselves only when risk is run — so there are those who take pride only in aiming high Such persons seem to find ego gratification in the hazards encountered and justify failure in terms of the risk Then there probably are persons who deceive themselves as to the social or intellectual importance of their goals, or, if the goal is a meritorious one, as to the nearness of their approach toward it This we should expect in view of the fact that so many persons do not evaluate their own abilities and accomplishments as others evaluate them Over-evaluation may be a temporary palliative as it serves for a time as a protective mechanism But like those

[1] G W Allport, *Personality, a Psychological Interpretation*, p 169 New York Henry Holt and Co , 1937

who indulge excessively in optimistic fantasy, those who have recourse to this "medicine" let themselves in for some rude disillusionment, unless they have succeeded in building an impregnable wall, so to speak, about themselves "But in every case one's level of aspiration betrays in some way the 'upward tendency of the Ego.'" [2]

Level of aspiration may be determined by several factors, as (1) previous experience, (2) face-to-face social situations, and (3) the group with which one identifies himself [3] The latter may also account for the fact that some persons strive for goals above their level of achievement In one social group the aspiration to be a streetcar motorman may be socially laudatory, in another, it may lead to a loss of caste It should be abundantly clear, if the moral need be drawn, that in the classroom the level of aspiration of the pupils will be influenced by the morale of the class and the school Correspondingly, "failure" in one classroom, under one teacher, or in one school may be much more real than in another The reader will recall Helen Burns' commiserations with Jane Eyre to the effect that the Reverend Mr Brocklehurst's castigations brought her no loss of prestige among the teachers and pupils of Lowood School "Had he treated you as an especial favorite you would have found enemies, declared or covert, all around you"

Something of the maturity of personality is revealed in Rosenzweig's study of activity preferences Young children, when given a choice, typically elect to engage in repetitive activities in which success has already been achieved, as if delighting to demonstrate over and over their mastery in the situation Older and more mature persons risk the humiliation of defeat in preference to certain success at a task already mastered [4] Maturity of personality requires a somewhat realistic attitude toward accomplishment

[2] *Ibid*, p 170

[3] P S Sears, "Levels of Aspiration in Academically Successful and Unsuccessful Children," *Journal of Abnormal and Social Psychology*, 1940, Vol 35, pp 498–536

[4] S Rosenzweig, "Preferences in the Repetition of Successful and Unsuccessful Activities as a Function of Age and Personality," *Journal of Genetic Psychology*, 1933, Vol 42, pp 423–441

Anderson also reports that the introduction of material rewards led to a reduction in the level of aspiration for children of all ages That is to say, when such rewards were introduced children chose to try for them at lower levels of accomplishment than those to which they had formerly aspired This is easy to understand The winning of a prize, aside from its material worth, became itself a symbol of competence [5]

Level of aspiration provides an interesting experimental approach to the study of personality, in that an individual states his goal and subsequently demonstrates his competency in a social situation In a sense he is on trial "The level of aspiration situation is usually a threat to the subject's self-esteem in that he must not only exhibit his ability before someone else, but must openly commit himself as to his expectation of future achievement The subject attempts to meet this threat both by performing well and by manipulating his level of aspiration" [6]

Security and adequacy The distinction observed in the present connection between security and adequacy is that made by Plant [7] Any such distinction is arbitrary and is justified, if at all, only by its usefulness A sense of security, as the term is used by Plant, is a feeling of belonging which comes about, or may come about, by virtue of *who* one is, in contradistinction to and regardless of *what* one is Its primary source is the family The sense of security or belongingness is perhaps first implanted by the mother, as she fondles the child, showing her affection by countless comforting psycho-motor reactions, and thus expressing regard in ways that words cannot, then or later

Thus it is seen that one of the very important functions of the home is to provide a membership situation within which the child feels secure just because he is a member It is also seen that any home that does not provide such a haven – one in which the child is judged overmuch by what he is, rather than

[5] C L Anderson, "The Development of a Level of Aspiration in Young Children," *Doctor's Thesis* State University of Iowa, 1940

[6] J D Frank, "Recent Studies of the Level of Aspiration," *Psychological Bulletin*, 1941, Vol 38, pp 218–226 Frank's bibliography contains 28 titles

[7] J S Plant, *Personality and the Cultural Pattern*, Chapter V New York The Commonwealth Fund, 1937

who he is — is not fulfilling one of the primary functions of the home Institutions can minister to the vegetative and perhaps to the intellectual needs of the child quite as well, perhaps, as can the home, but they have not ministered to the emotional needs so well This is not to say that they could not do so to a greater degree than they have, if their importance were fully appreciated Perhaps the average home does not fully appreciate their importance either but the natural feelings of parents toward their children are so revealed in their psycho-motor reactions that the proper result may be accomplished more definitely than if the reactions were purposeful

The home is not the only source of such feelings religion is another Some forms of religion are conducive to the feelings that persons count in that religious system because of who they are, although religion may be a bit too remote and abstract to accomplish these ends well Perhaps the church, because of its immediacy and concreteness, is a more vital factor The fact of being an American, especially to a person who has seen a good deal of other countries, or one who has in a vital way experienced the protecting influence of his country's flag, just because he is an American citizen regardless of whether or not he is a person of importance, may in a sense give one a feeling of security And there is a chance that our schools could so order themselves as to promote the same ends, if pupils came to look upon the school as a source of protection in times of emotional stress — if belonging (membership), not in a physical sense, but in a psychological sense were a reality In any case the schools could avoid becoming the means of destroying the sense of security the pupils already have when they come to school However, if the roots are not laid in the home, and at an early age, it has seemed doubtful to some authorities that the deficiency can be wholly made up

The adequacy-inadequacy continuum, as used by Plant, is more like the superiority-inferiority continuum as used typically in psychology One's feeling of adequacy stems from *what* he is, has done, or can do Insecurity and inadequacy do not have the same origin, except that feelings of inadequacy, prompted by repeated failure, may, as Plant views the matter,

lead to feelings of insecurity, though such is not an inevitable result

Academic success, or success in any one of the many activities that resourceful teachers have a way of providing, may be expected to bolster and sustain feelings of adequacy in a pupil, it is not regarded, in general, as ameliorating the sense of insecurity That is, it is not regarded as doing so except in those instances in which inadequacy is the source of insecurity Achievement marks one for *what* he is, not for who he is

With the exception just noted, a sense of security can be fostered in a school only by leading the pupil to feel that he counts because he is a member, that as a person he is secure in the affections of the school group Ideally, his *academic competence should not be the price of belonging* He should be made to feel that he belongs even though he is inadequate In the home, as a natural consequence of familial affection and sympathy, the inadequate child may have all the more reason to feel secure His belonging is not affected by his poor health, deformity, or even imbecility Inasmuch as the school is a place of learning, robust play, social interaction, and the like, the pupil who is inadequate in these respects is likely to entertain doubts about his belonging If in the school, as in many homes, the child is made to feel that he belongs, that he is secure in the regard of his fellows and his teachers, this institution can at least avoid becoming a threat to his sense of security The school can do so if it has proper co-operation from the home Without doubt a good deal of the stress of school life is engendered by the home as it puts pressure upon the pupil to achieve beyond his capacity or compares him unfavorably with a more capable sibling or acquaintance Parents often seek adequacy in the accomplishments of their children and in so doing run the risk of aggravating the child's problems of adjustment to school life

Failure may lead to insecurity when it is a function of the attitudes of the group with which one is identified – failure as experienced, not failure in an objective sense As already pointed out, a teacher may be unable to fail a pupil, even though he may give him a failing grade Likewise it may some-

times be difficult to punish a pupil when the teacher has little prestige or the act for which he is punished is condoned by the group

It seems probable that leadership may foster a group spirit and a sense of solidarity that would be conducive to a sense of belonging This is a way of taking care of individual differences, those possessing leadership qualities are made to feel responsibility for the weaker members

As the writer understands the matter, feelings of security may survive in the presence of feelings of inadequacy, although the latter must be regarded as a threat to the former Presumably feelings of insecurity and feelings of adequacy may coexist, and the reverse may obtain A person who is adequate by every standard may show all the symptoms of insecurity, and one who is inadequate by every standard may show none of these symptoms As expressive symptoms of feelings of inadequacy Plant lists defiance, bullying, rebellion and fear reactions, and of insecurity, anxiety, uncertainty, nervousness, restlessness, shyness, etc On the face of it it would appear that there should occur a good deal of overlapping

The distinction drawn by Plant seems to be of first-rate importance, although the reader may not like the terminology The two phenomena, insecurity and inadequacy, may be regarded as involving frustration of two qualitatively different goals (1) achievement of emotional security through belonging, and (2) achievement of intellectual security through skills and work success (as suggested by George Bach) The problems remain the same Intellectual achievement does not compensate for emotional insecurity, or, in Plant's terminology, adequacy does not compensate for insecurity

Inferiority and compensation Feelings of emotional insecurity probably cannot be readily compensated – at least not in the usual sense of compensation by achievement, although feelings of security in the affection of one's family or intimate friends would seem likely to stand as a bulwark against many a threat to security from other sources Moreover, feelings of emotional insecurity may be compensated by fantasy and by identification with a love object We may also assume that a

strong sense of group membership at school may compensate for a lack of a feeling of membership at home On the other hand, feelings of inferiority or inadequacy may be ameliorated by compensatory achievement Indeed it would seem to be because of this fact that one is ever able to escape such feelings in the first place owing to the countless spheres of life in which one compares so unfavorably with others A good salesman may feel no concern about his fumbling the tools of a mechanic, and a scholar may experience no chagrin over his incompetence at both men's work But he does bestir himself in behalf of his status as a scholar — not in every field, but in the field in which he has staked his claim

> I, who for the time have staked my all on being a psychologist, am mortified if others know much more psychology than I But I am contented to wallow in the grossest ignorance of Greek Had I pretensions to be a linguist, it would have been just the reverse [8]

An individual is normally unable to satisfy many of his wishes or is able to do so only in a limited way Perhaps in a majority of cases such failure occasions no particular distress In many instances failure results from incompatibility of one's wishes He voluntarily foregoes the gratification of one wish in order to make another real Such failure is not a threat to status Someone has said, "If it were not for the war I would like this war" The import of which is that war relieves one of much of the burden of maintaining status It becomes unpatriotic, if not impossible, to purchase a new automobile, build a new home, take a trip around the world in quest of culture and trinkets Without doubt war serves to remove some of the usual harshness of social competition The men in service also find the uniform and army life in general a great leveler One man cannot lord it over another by means of his more stylish dress or his more stylish mode of living

There are instances in which the inability to satisfy a wish is a threat to one's status and to the preservation of self Such failure is of the greatest consequence psychologically

Bagby has suggested that inferiority complexes are fear re-

[8] W James, *The Principles of Psychology*, Vol 1, pp 310–311 New York Henry Holt and Co, 1890

actions to social disapproval or self-criticism He recognizes two stages in the development of the complex, the primary and the final In the primary stage fear reactions become attached to "social situations involving attitudes of disapproval" There arises a sense of personal inferiority, he suggests further, which has its origin in the criticism to which the individual is subjected This observation is continuous with the point made in Chapter III that self-appreciation is based upon a person's evaluation of the reactions of others toward him, and with socialized anxiety, mentioned in Chapter I The final stage is distinguished from the primary stage chiefly by the nature of the defense reactions and by the number of stimuli adequate to calling them out In the former the defense reactions are "numerous, simple, and transitory", in the latter, "few, elaborate, and persistent" The final stage is also marked by an increase in the range of adequate stimuli Initially the adequate stimulus may have been overt criticism or ridicule, in the advanced stage merely a lack of commendaton may call out defense reactions [9]

Moreover, inferiority feelings and the concomitant defense reactions tend somewhat to become generalized with the result that persons tend to over-react to adverse criticism in general Such persons are extremely sensitive, tend to be poor losers, over-react to commendation and, as Bagby suggests, develop facility in so turning conversation that praise is called for, or may even succeed in interpreting the most adverse criticism as praise They tend to be suspicious of the actions, gestures, and motives of others On the whole they do not relish competitive activities

Once inferiority feeling has advanced to the "final stage," it seems not to be easily assuaged, even by what would normally be regarded as successful compensation The usual symptoms may continue, though admittedly, in such cases inferiority may be accompanied by insecurity

In the more advanced cases it may be helpful to bring the individual to a realization that his symptoms have their origin

[9] E Bagby, *The Psychology of Personality*, Chapter VIII New York Henry Holt and Co, 1928

in an inferiority complex Such realization will not ordinarily resolve the complex, but if the cause of the symptoms is fully understood, if the person realizes that his feelings and defense reactions are typical of those having inferiority complexes, his condition is made more tolerable and he may be able to guard himself the more successfully against social embarrassment occasioned by the symptoms

Adler on inferiority and compensation In 1912 Adler published a treatise on organ inferiority, translated in 1917, in which he described numerous instances of *organ* inferiority and compensation [10] This work began with accounts of deficiencies in the renal apparatus and, as his theory was elaborated, later extended to various organs of the body

The principle of compensation appears to be an instance of what Cannon has called homeostasis (from the Greek *homeo*, alike and *stasis*, standing still), a head under which is listed a number of conditions that living organisms defend against change A warm-blooded animal, for example, by various mechanisms maintains its bodily temperature within very narrow limits There are other mechanisms which operate against loss of blood, depletion of water content of the body, and so on Commenting upon the principle of homeostasis Guthrie says "Living creatures differ from non-living creatures in that they react to change in circumstances by so changing themselves as to preserve certain of their essential characteristics constant" [11] These essential characteristics may be, in our culture, extended to include professional status, moral character, beliefs, and even the basic premises of a philosophy of life

Although in the 1912 monograph Adler makes frequent reference to psychic compensation, it is not clear, at least to the writer, that he was thinking of compensation in terms other than the role of the central nervous system in organ compensation In his *Individual Psychology*, published in 1922, and

[10] A Adler, *Study of Organ Inferiority and Its Psychical Compensation*, Nervous and Mental Disease Monograph Series, No 24 New York The Nervous and Mental Disease Publishing Co , 1917

[11] E R Guthrie, *The Psychology of Human Conflict*, p 4 New York Harper and Brothers Publishers, 1938

translated in English in 1925, compensation in the behavioral sense is brought to the fore [12] This principle of homeostasis — this "striving" to maintain one's essential characteristics constant — becomes, for Adler, the dynamics of personality

Every psychic phenomenon is envisaged as a preparation for some goal Adler's "*most general presupposition*" is that "the psyche has as its objective the *goal of superiority*" [13] He maintains that this presupposition holds equally well for the mentally healthy and the diseased That which distinguishes the diseased from the healthy individual is not a difference with respect to goals but the fact that "the former's life-plan" is filled with "stronger safeguarding tendencies"

He sees in this goal of superiority the fountain source of human striving If everyone is actuated by this goal, then says Adler, we ought to encounter efforts to minimize and undervaluate others "Traits of character such as intolerance, dogmatism, envy, pleasure at the misfortune of others, conceit, boastfulness, mistrust, avarice — in short all those attitudes that are the substitutes for a struggle, force their way through to a far greater extent, in fact, than self-preservation demands" [14]

Adler gave a name and articulate expression to the phenomenon in question and showed how it worked itself out in the life plan of the individual However the phenomenon itself had probably been recognized for generations beforehand Fielding, Dickens, Thackeray and other great delineators of character frequently portray this human trait For example in his *Martin Chuzzlewit* Dickens caused Mr Pecksniff to remark to his two daughters "It is always satisfactory to feel, in keen weather, that many other people are not as warm as you are" And this, he added, was quite natural, and a very beautiful arrangement, not confined to coaches, but extending into many social ramifications Mr Pecksniff was, of course, a villain But as Adler would, perhaps, contend, the difference between a vil-

[12] A Adler, *The Practice and Theory of Individual Psychology* New York Harcourt, Brace and Co , Inc , 1925

[13] *Ibid* , pp 4 and 7

[14] *Ibid* , pp 8 and 9 Reproduced by courtesy of the publishers

lain and a hero is a difference in social evaluation of the behavior (of the two men) by which each strives to attain his goal of superiority [15]

Reactions to frustration The dynamic properties of personality may also be seen in reactions to frustration An individual is said to be frustrated when he is balked in his drive toward a goal Dollard *et al* define frustration as "that condition which exists when a goal-response suffers interference" [16] To paraphrase Ach's laws (which see), we may suppose the stronger the determination and the stronger the resistances that oppose the determination, the greater is the degree of frustration experienced, and, putatively, the more vigorous are the defense reactions The frustration-aggression postulate of Dollard *et al* is "that the occurrence of aggressive behavior always presupposes the existence of frustration and contrariwise, that the existence of frustration always leads to some form of aggression" [17] It is understood that aggression need not mean a direct, overt attack It may take the form of increased effort to attain the goal or any of the numerous forms of defense reaction, overt or implicit It may be directed toward the frustrat-

[15] It is to Adler's credit, as it is to Freud's, to have emphasized with such force the dynamic or motivational aspects of mental life But in his recognition of but a single goal, that of a striving for superiority, he, like Freud, has probably taken too limited a view of the matter McDougall, whose psychology is quite as purposive as that of Adler, posits 18 innate propensities — as the constructive propensity, the acquisitive propensity, self-assertive propensity, submissive propensity, and so on McDougall regarded these as the primary or basic motives of life to the satisfaction of which all strivings have their being Although capable of functional extension by conditioning or otherwise, these innate propensities stand as the fountain head of all motives, in McDougall's system (W McDougall, *The Energies of Men*, pp 97–98 New York Charles Scribner's Sons, 1932)

Over against the foregoing views that all motives are reducible to one or some number of innately given conditions, interests, or propensities is the position that goals do not stem from one, eighteen, or any number of innate propensities, except in so far as they are starting points More to the point, this position denies that a goal need derive its efficacy from an innate predisposition at all This view holds, to use a term adopted by Allport, that motives are functionally autonomous (*cf* Chapter XVI)

[16] J Dollard, *et al*, *Frustration and Aggression*, p 11 New Haven Yale University Press, 1939

[17] *Ibid*, p 1

ing object or condition or toward "some altogether innocent source or even toward the self", or it may have no particular direction, as in infantile rage

These authors, in elaborating the hypothesis, set forth three determining conditions of the amount of frustration and its reciprocal, the strength of aggression instigated, to wit "(1) the strength of instigation to the frustrated response, (2) the degree of interference with the frustrated response, and (3) the number of frustrated response-sequences"[18] The first two conditions are analogues of Ach's third and fourth laws of feeling, respectively These determining conditions are supportable by experimental data[19]

Among his first lessons of life an individual learns that it is expedient to inhibit certain of his aroused tendencies As he grows in social competence the extent of his inhibitions becomes enormously enlarged In the work under discussion the authors state that inhibition of an act of aggression varies directly with the strength of the punishment anticipated, punishment in its most universal meaning It is also noted that inhibition of acts of aggression leads to additional frustration The frustration induced by inhibition becomes an additional source of aggressive behavior, the two frustrations tending to summate

Frustration experiments hold considerable promise as a method of investigating individual differences in personality Rosenzweig, in his investigation cited above, engaged college students in tasks the majority of which could not be solved in the allotted time He noted three types of response to failure some students blamed the environment, some, themselves, and some simply experienced embarrassment without blame Barker, Dembo, and Lewin's experiment is apropos[20] Their subjects, children 2 to 5 years old, placed in a play situation —

[18] *Ibid* p 28

[19] *Cf* L W Doob and R R Sears, "Factors Determining Substitute Behavior and the Overt Expression of Aggression," *Journal of Abnormal and Social Psychology,* 1939, Vol 34, pp 293–313, and six articles on frustration and aggression in the *Psychological Review,* 1941, Vol 48, pp 337–366

[20] R G Barker, T Dembo, and K Lewin, "Frustration and Regression an Experiment with Young Children," *University of Iowa Studies Studies in Child Welfare,* 1941, Vol 18, No 1

apparently, a satisfying one — were allowed to manipulate the various play materials for a time, during which observers recorded the play responses of each child These responses were made the basis of a "constructiveness of play" score After the children had engaged in this free play situation for 30 minutes, an opaque screen was removed which permitted them to enter a portion of the room containing more attractive and previously unseen play materials They were allowed to explore this new material for a time and were encouraged to examine all of it Immediately thereafter they were returned to the original portion of the room, re-engagement with the more attractive toys being prevented by means of a drawn partition of wire fencing They were now permitted to play only with the original and less attractive toys, the more attractive ones remaining visible

Marked individual differences in reactions to the frustrating situation were noted Some children showed no further interest in the new toys, others displayed violent emotion, some attempted to reach them, others merely displayed restive behavior On the whole the play activity with respect to the original material was less constructive, by 17.3 months on the constructiveness scale, after the episode with the new and more attractive toys than beforehand This the authors interpret as regressive behavior — return to a lower (more infantile) level of activity — in consequence of frustration

Reactions to frustration situations have proved to be highly variable Some individuals become quite disturbed emotionally, although Sherman notes that those who are otherwise well-adjusted are not so likely to do so Reactions to frustration are difficult to study in sophisticated subjects owing to their tendency to inhibit revealing overt reactions Muscular tension records have proved to be a fairly serviceable means of determining quantitative differences in reactions to frustration situations, as is seen, for example, in the investigation of Duffy [21]

Sherman reports some investigations in which students, children and adults, working in the presence of fellow students,

[21] E Duffy, "Tensions and Emotional Factors in Reaction," *Genetic Psychology Monographs*, 1930, Vol 7, pp 1–79

were first engaged in comparatively easy tasks, and later in extremely difficult tasks Following the execution of each task the correct answer was flashed on a screen so that the subject knew immediately whether or not his response was correct Throughout, the subjects were led to believe that the tasks could be learned readily

The adult subjects responded to failure more quickly than children Most subjects exhibited heightened muscular tensions Some of the adults responded by various gestures such as biting the lips, scratching the face, and straightening of their clothes The majority made various deprecatory remarks about the nature of the task, or rationalized their failure by implying that the task was worthy only of children Most adults smiled and laughed when they encountered failure, "as if they were denying to themselves the importance of failure" The children rarely smiled or attempted to rationalize On the whole the reactions of the children were more violent than those of the adults – perhaps they were less inhibited Aggressive behavior was directed toward the experimenter, by way of accusations for his making the task too hard and keeping them at the task against their will [22]

In another investigation reported by Sherman, various physiological reactions – blood pressure, respiratory rate and amplitude, hand tremors, psychogalvanic reflex, and brain waves – of neurotic and non-neurotic children (as independently determined) to frustration situations were compared The reactions of the neurotic children were more marked by all measures with the possible exception of brain waves, where the results were somewhat equivocal Not only did the neurotic children respond more quickly to frustration, but they also required a longer time for the return to normal conditions with respect to these measures

Conflict Discrepancies between one's goals and his attainment leads to conflict Incompatibility of goals, as when in order to realize one goal a person must foreswear another, may also lead to conflict, although the seriousness of conflict prob-

[22] M Sherman, *Basic Problems of Behavior*, pp 96–97 New York Longmans, Green and Co, 1941

ably varies with the amount of ego involvement The conflict itself may be characterized as an unpleasant affective reaction Every instance of failure of goal attainment and every instance of incompatibility of goals presumably leads to some unpleasantness Many such instances lead but to transitory conditions, which are easily resolved and produce no important and lasting effects On the other hand, those resulting from conditions that constitute a threat to security and adequacy, and especially those that involve a sense of blame and lay the individual open to criticism are likely to be more lasting and to lead to more serious consequences

Mental conflict is one of the consequences of mental development Writers in the field of mental hygiene have pointed out that conflicts may arise in the life of a child as soon as his mental development permits of self evaluation — as soon as he becomes conscious of the valuation others attach to his behavior However, inasmuch as the young child normally leads a highly protected life in the sense that comparatively little of his behavior comes under the critical reflection of society, he is subject to comparatively few conflicts

When the child enters school and as he progresses up through the elementary grades, the field of his competitive behavior widens, the number and complexity of his goals increase, and much of his behavior comes under critical observation and social evaluation, and even his goals and the more private aspects of his life, such as his interests and motives, come under the pale of social criticism As he approaches maturity he comes into possession of certain biological impulses that are met by a stubborn array of social taboos, and a sense of guilt occasioned by violation of the sex mores may sometimes be quite disturbing

Conceivably, a lack of social success with members of the opposite sex and inability to command the attention of desired companions, in a manner that has little to do directly with the satisfaction of the biological impulses, are a greater source of conflict than the scant emphasis they have received would indicate The inability to satisfy these biological impulses does not normally lead to loss of status The very presence of social

taboo protects his ego On the other hand it is expected that upon the attainment of a certain age and social position a person will participate in social activity involving the two sexes Lack of success here cannot well be hidden from social inspection and the individual who fails in his social ambitions stands to experience unfavorable comparison with others In such instances the resulting conflicts may be re-enforced as it were by emotional reactions of another sort as the individual may attribute his failure to deficiencies in personal appearance or social upbringing, to the social and economic position of the family or to racial, religious, and nationality discrimination

By the time a pupil reaches high school age he gains a certain amount of freedom from the restraints of the primary group and begins to make adjustments to secondary groups Many pupils at this time find that the cherished customs and standards of the primary group constitute barriers to their full acceptance in the new groups The desire to be identified with these new groups and an unwillingness to give up the social standards of the primary groups may lead to serious conflict Thus the pupil finds himself in what sociologists have called the inter-group situation This situation may be particularly acute among pupils in certain immigrant groups as they find that old-world mores tend to prevent their being taken in by groups with which they wish to be identified This is especially true of nationalities that have inferior status in this country

Outlet or interaction? Among psychiatrically oriented psychologists and educators, the term *outlet* is overworked Play is an outlet, music, sports, formalized athletics, the countless activities of the classroom and school are outlets "What does the coach do other than train his charges to express anger and aggression in socially acceptable ways?" [28] This is a serious issue One certainly has a right to inquire Why should anger and aggression be expressed at all? One is reminded of Mark Twain's humorous explanation of masculine osculation practiced as a form of greeting in Biblical countries, namely that men have to kiss something, and the women are too ugly, so they fall to kissing each other

[28] Plant, *op cit*, p 299

Is a person normally impelled to express something? We are told that music is a means of working off a mood It is also the means of working up one And the coach must first work up anger and the aggressive spirit in his charges Did he not go to great pains to kindle these impulses would there be any great desire to express them? Do they need expressing anyway even when aroused? Does anger when aroused require a "working off"? May not one simply "cool off," without so much as moving a muscle? Perhaps many will agree that sleep, "nature's great cordial," is the surest and speediest way of ridding oneself of a passion or a mood

The term *outlet* and *expression* may be convenient and useful, though we have probably taken too limited view of the matter Play or participation in social life, "activities," and most other things of this class are not simply responses to impulses that well up within as natural conditions, like hunger and reproduction urges The hungriest and thirstiest persons are those who have been deprived longest of the sustenances appropriate to their satisfaction If all forms of human behavior followed the pattern of these biologically given forms, we should find that people who have long gone without combat, for example, should become restless and anxious for warfare, that the peoples of the most limited cultures should simply be teeming with unfulfilled desires, and bursting with all kinds of impulses seeking an outlet

Everyday observation seems to suggest that the situation is just the reverse It is the people who have the greatest opportunity for warlike expression who are most warlike A culture rich in art and music is the very means of stimulating the "need" of expression as well as providing opportunities for expression If this is correct, then the people that have the most art, music, war, golf, and competitive sport, and learning, have the strongest urges toward expression along these lines, and a people without any of them, if there ever were any such, would be utterly complacent without any such expression Similarly, children that have played the most and who know the most games would have the greatest need of "expression" through play

This is a tremendously important matter We need to know what the truth of it is Have we provided the means of educational growth and development of children when we give them a chance to express themselves, or must there be provided also the desire for expression? And in the right direction? Why expression anyway? Is it because a child is unhappy if he does not express something, unless he has an outlet?

Perhaps there is no great value in sheer expression, were such a thing possible What we find is not mere expression but interaction between the individual and the forces of his environment This interaction is the means of mental development Society, including the school, stimulates the child in various ways, he reacts to this stimulus complex in such a way as to preserve his ego These reactions in turn provide the avenues of mental development But it is of the greatest importance to realize that what comes in is just as essential to the educational process as what goes out The stimulus is just as important as the response Thus we have not made adequate arrangement for a child's education when we provide outlets and the means of expression, we must also provide the stimuli requisite to the evocation of educationally fruitful expression Outlet is much too limited a concept Interaction is preferable

In societies in which the accumulation of private wealth is condoned and rewarded — which is most of them — a person may seek an outlet for his acquisitive impulses by the securing of money, land, goods, or whatever is of recognized value However, in other societies which place great store by sharing, men may vie with each other in giving away Neither form of behavior is merely an outlet It is a form of interaction between the individual and a highly complex social structure

MODES OF ADJUSTMENT

In the foregoing pages have been presented several concepts that have found their way into treatment of personality within the last two or three decades The writer's object has been to put before the student of education some of the dynamic factors in personality development, rather than to give a systematic and historical treatment of the concepts Self-preservation —

the maintenance of self-regard, self-esteem, or anxiety about it —is probably the dominant note It is indicated that failure to realize a goal, any goal whatsoever, leads to a condition of disturbance, frustration, and consequent "aggressive" action But those conditions in which failure threatens loss of status and reduces the sentiments of self-regard are of the greatest consequence in personality development

In the following paragraphs a brief account is given of the commonly recognized modes of adjustment, or, as may be said, some instances of homeostasis as applied to personality A great variety of names is encountered Shaffer reports the finding of sixty-five names of mechanisms listed in only seven books on mental hygiene Only two, *daydreaming* and *repression*, were listed in all seven books Two more, *rationalization* and *compensation*, were cited in six of the seven books, and four, *anxiety, dissociation, hysteria*, and *phobias*, in five books Of the others, five are mentioned in four books, six, in three, twelve, in two, and thirty-four, in one [24] Shaffer himself groups the mechanisms under five heads (1) adjustment by *defense*, typified by marked aggression, usually involving undesirable or antisocial behavior, (2) adjustment by *withdrawing*, characterized by unwillingness to participate in social behavior, (3) adjustments involving *fear* and *repression*, (4) adjustment by *ailment*, and (5) *persistent nonadjustive reactions* A characteristic which all adjustment mechanisms have in common is their *protective* or *safeguarding* function [25]

Defense reactions The reactions usually listed in this group are logically related in the sense that they appear to stem from a common source, a sense of inferiority They differ from withdrawal reactions in that they are more aggressive Once a feeling of inferiority has developed to the "final stage," compensatory behavior may exhibit an intensity and a degree of aggressiveness much beyond that normally required for the preservation of the sentiments of self-regard In such a state individuals are reluctant to accept responsibility for defeat

[24] L F Shaffer, *The Psychology of Adjustment*, p 144 Boston Houghton Mifflin Co, 1936

[25] *Ibid*, p 145

They are inclined to shift the blame, as in *projection*, or to minimize the failure or justify it protectively, as in *rationalization* They may also *identify* themselves with a successful person or group or a winning cause, as a technique of defense Some resort to *egocentric behavior* as an attention-getting device, as if, perhaps, to assure themselves of response from others It has also been suggested that many of the behavior problems in school that require disciplinary measures are traceable to inferiority feeling Such forms of antisocial behavior are regarded as defense mechanisms They may assure a certain amount of social approval from some groups However, it seems easy to carry this interpretation too far Some behavior problems, or at least conduct problems that are quite disturbing to the teacher, may simply stem from group mores

Withdrawal There is much overlapping in function between withdrawal and defense reactions *Timidity, diffidence, fantasy, negativism,* and *regression* are protective or defensive quite as much as the defense reactions They are more subtle and are less aggressive Of this group only fantasy is compensatory in an important degree They are all safeguards Sherman makes the point that the nature of the child's early home life may be a disposing factor with respect to the kind of reaction adopted If parents are hypercritical and resort frequently to punitive measures, he is likely to develop some form of withdrawal response when faced with difficulty If, on the other hand, the parents are over-indulgent and encourage attention-getting mechanisms, the child will have a tendency to resort to egocentric behavior when frustrated [26] Thus when pupils are faced with a situation that threatens their security, they may be expected to make use of reaction patterns that have proved successful in the past

Withdrawal reactions may have an origin common with defense reactions, to wit, loss of security and feelings of inferiority. They may also have a somewhat different, though related, origin In a sense, they may be said to spring from a broader base, namely a generalized fear reaction. These fear reactions may

[26] M Sherman, *Mental Hygiene and Education,* Chapter IV New York Longmans, Green and Co, 1934

have their beginning in harsh, cruel treatment at the hand of a parent, or in unfortunate experiences of various kinds The origin of the fear reactions may be in actual or anticipated bodily violence or in embarrassment in social situations A poor showing on the playground, owing to clumsiness or physical defect, may lead to ridicule and consequent embarrassment Social rebuffs, unattractiveness in personal appearance, mental handicaps, hard treatment by stern and unsympathetic teachers, lack of social grace, and similar factors may contribute to the upbuilding of generalized fear reactions

The diffident pupil, or one who has met with repeated rebuffs, may seek solace in books, hobbies, and fantasy No one of these pursuits is in itself undesirable In fact there is a measure of good in each Naturally they are detrimental only when carried to the extreme But because of the purpose they serve and the satisfying nature of the responses, they have a tendency to be indulged in excessively In such instances the pupil tends to lose social *rapport* and contact with reality

Daydreaming and the reading of romantic literature may be a healthy stimulus, and actually elevating But because of their romantic and satisfying qualities they may get out of hand The pupil may find the humdrum of reality drab and uninteresting in comparison In fantasy he can arrange the stage of life and its actors as he wishes Thus he may come to prefer the imaginary exploits of his daydreams and the romantic world of the novelist to his feebler exploits in the world of reality

The various patterns of daydreams suggest strongly that they frequently serve as compensatory mechanisms Green's classification of daydreams, according to type, suggests this *display*, in which the daydreamer gains applause for some act of daring, *saving*, wherein he gains the gratitude of the person "saved" and acclaim of others, *grandeur*, in which he represents himself as a person of great consequence, and *homage*, in which a personal sacrifice of great cost is made in behalf of another whose "love or sympathy is sought" [27] Much autistic thinking of this character is in the realm of the improbable There appears to be some advantage in this from the stand-

[27] Shaffer, *op cit*, p 191

point of the mechanism involved, in that the daydreamer is protected from rude awakenings that would surely follow if the test of reality could be applied

In view of the highly satisfying aspects of daydreams it seems likely also that many children and adults indulge in them merely as an interesting pastime Children who are wanting in companionship, books, and other forms of diversion are prone to fantasy Pupils who have difficulty in reading or who are typically given reading assignments that are unsuited to their abilities and who are unchallenged much of the time by their lessons are also likely to spend an excessive amount of time in daydreaming

Fear and repression It is seen above that fear is prominently associated with the origin of defense and withdrawal reactions In fact those reactions serve to protect individuals against fear The reactions described here are themselves fear reactions, not protections against fear Individuals who are subject to persistent or frequently recurring fears are emotionally maladjusted While the character of defense reactions may be such as to produce social maladjustment, or to warp the personality, or actually to be disabling, a measure of emotional adjustment (fear reduction) is achieved

Two forms of persistent non-adjustive fear reactions are recognized, phobias and worries Phobias are strong, uncontrollable fear reactions to a restricted class of stimuli They have their origin in some traumatic incident or emotional crisis Another characteristic of phobias is that there is some transference of the stimulus properties of the inciting incident to other stimuli of the same class For example, the chief symptom of a young woman (described by Bagby) was an uncontrollable emotional reaction to running, splashing water, not merely to the provoking object – waterfall When riding on the train she kept the shades drawn so as to avoid seeing the streams over which the train passed In the early years the services of three members of her family were required in order to give her a bath

Another factor associated with the etiology of phobias is a sense of guilt The individual is bent on some forbidden mis-

sion when the crisis occurs Putatively, it is this condition that leads to the next characteristic, namely repression or forgetfulness of the incident, or at least a failure to accept the inciting incident as an explanation of the symptom This is borne out by the fact that such an individual is unable to give any account of the grounds for the phobia Indeed the discovery of the cause, by the help of a psychiatrist, usually serves to extinguish or greatly reduce the fear reaction It is thought that the sense of guilt is instrumental in repressing the incident, because the person is not so likely to relate the experience to others, as he would do at once were there no sense of guilt Owing to its unpleasantness he also tries to forget it Whether or not entirely stable persons are able to repress completely such an experience is problematical However, it appears that some, neurotic or otherwise, succeed in doing so

Worry, as described by Bagby, is a "persistent mood of fear" aroused by a situation for which the individual has no reduction mechanism If the inciting conditions remain in the consciousness of the individual, that is, if he remains conscious of the conditions as sufficient causes, he stands to make some adjustment after a longer or shorter time If, however, repression occurs, if he represses his thoughts on the subject, so that the symptoms are no longer connected in thought with the provocation, and the provocation remains, the mood of fear will continue This circumstance is known as morbid worry

Ailments, adjustive and non-adjustive The ailments here referred to are of the functional variety, belonging to the group commonly included under the caption *hysteria* We are indebted to Janet for a classical treatment of this group of ailments [28] Perhaps shellshock and the *amnesic fugue* constitute the most dramatic first-hand examples The former includes such well-known symptoms as functional paralysis, functional anaesthesia, tics, and compulsions [29] The significant element in these cases from the standpoint of adjustive behavior is that

[28] P Janet, *Major Symptoms of Hysteria* New York The Macmillan Co, 1913

[29] W McDougall gives an excellent account of these disorders in his *Outline of Abnormal Psychology*, Chapters XII and XIII New York Charles Scribner's Sons, 1926

there is an advantage in them to the patient The soldier is actuated by two powerful and contradictory impulses a sense of patriotism and devotion to his homeland and fireside on the one hand and fear and the desire to escape the privation and terrors of modern warfare on the other An ailment like paralysis of a limb or loss of sight would incapacitate him for service at the front and would at the same time preserve his honor and sense of patriotism McDougall suggests that it is unlikely that a person of entirely sound constitution is subject to this mode of adjustment But he thinks persons of originally sound constitution may, when subjected to prolonged privation and exposure, succumb to shellshock The amnesic fugue, as occasionally described in the daily press, is likewise regarded as a protective mechanism — an escape from a burdensome reality

It is not to be supposed that these or other ailments of this class are of frequent occurrence, or that the teacher is expected to be able to diagnose and treat them However they do show the extent to which individuals may be driven, in extreme circumstances, in order to resolve conflict and attain a measure of adjustment The dynamic principles of behavior as seen in these exaggerated forms are the same as those reactions described earlier Adler's pronouncement that the abnormal differ from the normal only in the intensity of their defense reactions is apropos

THE "NERVOUS BREAKDOWN"

The term *nervous breakdown* covers a multitude of sins It is without precise meaning, in that it has no particular symptomology It is a popular and tolerably honorable term owing to the fact that it is generally believed to be caused by overwork — a cause having some respectability if indeed one not amounting to a virtue

Overwork, if the work is of an agreeable nature and if the worker is actuated by the attractiveness of the task or the normal desire to get ahead, is not exactly a trait to be guarded against If overwork under these conditions is undesirable it is because of social deprivation or considerations of general

health The latter may lead to illness, but not to a nervous breakdown, in the usual meaning of the term Perhaps the reason overwork is associated with the nervous breakdown is the fact that a period of hard work often precedes the breakdown This hard work is a *symptom* — a symptom that all is not going well, that the individual is in trouble — not a *cause* The breakdown occurs because overwork fails to remove the difficulty, to resolve the conflict The nervous breakdown serves as a partial, though not a very successful, adjustment which the individual did not succeed in accomplishing by hard work At least it is a graceful type of defeat, owing to the praiseworthy aura associated with work As has been said, overworry, not overwork causes nervous breakdowns

Experimental neurosis Krestovnikova, a student of Pavlov, trained a dog to salivate whenever a circle of light was thrown upon a dark screen The dog was so conditioned by the co-presentation of food and circle After a number of such presentations the dog would respond to the conditioned stimulus (the circle) when presented alone When the conditioned salivary response was thus established, the animal was confronted with another stimulus, an ellipse, presented without re-enforcement (by food) At first saliva flowed in response to the ellipse, but as the experiment continued, the circle being frequently re-enforced, the ellipse never, it came to pass, after a great many trials, that the circle alone elicited the salivary response Then as this procedure went forward the discrimination was made more difficult by varying the ellipse in the direction of the circle The dog succeeded in discriminating between the two figures when their axes stood in the relation of 7 8 But when the ellipse was so altered that the axes were in the relation of 8 9, the two figures now being scarcely distinguishable, the inhibition of the salivary response to the ellipse broke down The discrimination could no longer be made at any level of difficulty, either stimulus elicited the response "The dog began to whine, barked fiercely at the screen, tore at his restraining apparatus with his teeth, and attempted to jump down from the table . Saliva would flow at sight of the experimenter, or at sight of the experiment room, or at

almost any stimulus "[30] It is as if, Garrett suggests, there occurred an almost complete collapse of the dog's differentiating ability, owing to the placing of too great a strain upon the brake[31]

This phenomenon observed by Krestovnikova has been subjected to a good deal of experimentation by other workers and has come to be known as experimental neurosis In 1927 Liddell published a report on the production of experimental neurosis in sheep, using the method of the 'delayed reflex "[32] It is known that if the conditioned stimulus, the circle, for example, be presented for an interval, say 30 seconds, before the introduction of the unconditioned stimulus, say food, a condition may be established wherein the conditioned response will not appear immediately upon the presentation of the conditioned stimulus but will be " delayed " for a period approximately equal to that which separated the two stimuli in the training series Liddell applied an electric shock (unconditioned stimulus) to the fore leg of a sheep on the sixth beat of a metronome set at 60 beats per minute The shock produces flexion of the leg Such animals can be rather easily conditioned to leg flexion upon the beat of a metronome However, when the delayed condition was introduced, the shock being introduced on the sixth beat, the task proved to be very difficult for the animal After 98 presentations of shock on the sixth beat, 15 trials a day, the delayed reflex appeared That is, flexion occurred on the sixth beat without the shock But on the next day the behavior broke down The animal showed signs of general nervousness and exaggerated leg movements occurred in response to each beat

Anderson and Liddell have pointed out a crucial condition of experimental neurosis, namely that mere difficulty is insufficient, difficulty must be accompanied by impossibility of

[30] H E Garrett, *Great Experiments in Psychology*, p 92 New York D Appleton-Century Co , 1930

[31] See I P Pavlov, " Communication Neuroses in Man and Animals," *Journal of American Medical Association*, 1932, Vol 99, pp 1012–1013

[32] H S Liddell and T L Bayne, " The Development of 'Experimental Neurasthenia' in Sheep during the Formation of Difficult Conditioned Reflexes," *American Journal of Physiology*, 1927, Vol 81, p 494

escape Animals in free situations – those from which they can escape if they so elect – do not exhibit the phenomenon, they do so only when confronted with an insoluble problem from which they cannot escape [33] Certainly no such simple experimental condition would produce a breakdown in a sophisticated adult But situations involving defeat or a serious loss of prestige from which escape is not found, and especially those involving a sense of guilt which cannot be rationalized, seem capable of producing putatively similar symptoms in some people [34] In all probability there are large individual differences in susceptibility to the nervous breakdown [35]

THE SCHOOL

Personality development The dynamics of personality appear in full force once consciousness of self arises, and this it does long before the child comes to school Of course, selfhood does not emerge full-grown upon the scene in early childhood It means different things at different stages of development It grows as the child's experiences broaden, taking on an academic aspect, a social aspect, a religious aspect, a professional aspect, and so on The child's sense of security arises at an early age in the home His sense of adequacy has its first

[33] O D Anderson and H S Liddell, "Observations on Experimental Neurosis in Sheep," *Archives of Neurology and Psychiatry,* 1935, Vol 34, pp 330–354

[34] The reader's attention is called to Chapter XVIII ("The Nervous Breakdown") in Guthrie's *The Psychology of Human Conflict Loc cit*

[35] More recently Maier's investigations of experimental neurosis in the white rat have attracted wide attention Maier (N R F Maier, *Studies of Abnormal Behavior in the Rat* New York Harper and Brothers, 1939) observed two phases in the neurotic behavior of the rat, the active and the passive In the former the animals jumped from the platform with a sudden, undirected leap, ran in a circular path on the floor, and many exhibited violent convulsions and tics involving the head and forelegs In the passive phase, which followed, the animals remained motionless, typically maintaining the position in which the experimenter left them In this phase they were irresponsive to loud noises and other forms of sudden stimulation Maier noted certain important differences between fear reactions and neurotic reactions In fear the animal runs to cover, in the neurotic seizures they run in circles, frequently bumping into the walls and furniture In fear they struggle when picked up, in the neurotic attacks they did not struggle The motionless behavior of the second phase is not present in fear reactions

awakening there also But as he enters into play relationship with other children, enters into competition with others in school and in social ramifications of various sorts, his sense of adequacy is put to serious test

The school has a responsibility both for security and adequacy The former is provided for when the child is made to feel that he belongs, that he counts because of who he is The sense of adequacy is nourished as opportunities are provided for the winning of recognition

In the foregoing we see two directions which adequate development of personality must take Another is development in the direction of sensitization to persons outside the immediate family Naturally this means the development of techniques of getting on with persons outside the family, but it also means the development of concern about their opinions and reactions toward one's behavior Thus personality development means a kind of weaning of the child from his family, a weaning in the sense that others figure prominently in his life It is especially important that the child become identified with other children of his own state of development, and that he feel he belongs to the group and is adequate with respect to it The pupil sometimes requires a weaning from the teacher as well as from the parents, and to be thrown upon his own resources with his fellows In these matters the teacher may best serve as a sort of arbiter, realizing that some children require help However, this help should not be in the form of taking the child under her protecting wing, but rather in the form of helping him to adjust to the group. Ability to get on with one's fellows is one sign of an adequate personality

Complementary to social development is the development of self-sufficiency One should not be miserable when alone Plant has made the point that a moderate degree of introversion is favorable to self-sufficiency, just as a moderate degree of extroversion is favorable to social adequacy These two traits need not be entirely incompatible, if we may avoid extremes An extremely introverted person naturally has few extroverted characteristics, and vice versa, but a better balanced person has a liberal amount of each trait Some of our schools, espe-

cially at the secondary level, have shown a proclivity toward the development of extroverted traits Indeed there is some support for this tendency in psychiatric literature Moderate extroversion is generally regarded as being more fitting to sound mental health On the other hand, one wonders if the nature of much industrial work, as on the assembly line, and the apartment house and other features of urban life, are not such as to place a premium upon moderate introversion Fortunately, shorter working hours and higher wages have provided some compensation for the social deprivation of industrial work Incidentally, since the teacher's work provides him with few normal social contacts and since he is often restricted in social participation after school hours, the sense of self-sufficiency that goes with introversion would seem to make this a desirable trait in persons of that profession

Another feature of personality development is increasing susceptibility to control by symbols Abstract justice, right and wrong in the abstract, fair play, and the rights of others do not play so important a role in the life of the child as they do in the life of an adult The child lives more by expediency As he grows older his life tends to be regulated more by principles, by symbols

Increasing emotional maturity deserves a place of first rank in importance While realizing that emotional disturbances are at the bottom of nearly all symptoms of maladjustment, it does not follow that the answer, in so far as the school is concerned, is a greater measure of protection Certainly a sign of emotional maturity is the ability to withstand adversity Obviously a child can be sheltered to a point that is detrimental to the realization of this end Such overprotection is more likely to obtain in the home than in the school As noted earlier, in school we simply have been unable to carry protection to so great an extreme Perhaps we have been justifiably concerned about protection, since school life ordinarily provides considerable hazard to the children who come to school emotionally immature Certainly we need not go out of our way to increase the hazards to emotional balance of our pupils, but at the same time it need not disturb us that there are hazards

The school as a way of life One of the tremendously important events in education has been the realization that the school is life, and not *merely* a preparation for life As is our great proneness in education, we seemed to be unable to add this important ideal to the existing objective of preparation for adult living We had to stultify ourselves by ranting about schools not being a preparation for adult life, but its being life It must seem pretty obvious that we in America would not invest some three billion dollars annually to provide opportunities for eventful living for our children unless we thought this eventful living would somehow influence their living afterward

Writers must have labored under the notion that teachers cannot hold two ideas in mind, and that to make place for the new one, the old one must be dispelled The school is first and foremost a preparation for adult life The important novelty has been the realization that this end is best served by providing a rich, eventful, and wholesome life for the pupil here and now The school can discharge its obligations in preparation for life only by providing for life now, so that the child grows by living This means conditions for happy, healthy, emotional life, play, and social participation and interaction in addition to experiences with the world of knowledge and the tools of civilization

While realizing that our schools should be lifelike, we should be able to see something of the ludicrous in the following injunctions, *ex cathedra,* found in a certain modern book on education (1) let the schools be lifelike, (2) abolish failure, and (3) banish competition Perhaps we can all agree that our schools should be as lifelike as is consistent with good instruction — and that in most cases will mean a good deal more lifelikeness than is now present, and that there is too much failure and too much competition, but a school without them certainly cannot be lifelike The latter contingency need not worry us, because there will probably be a sufficiency of both after we have done our best to eliminate them

Those in charge of certain radical schools have asserted that there are, in their schools, no failure and no competition If this were true, we could guess that they not only have no fail-

ure and no competition, but that they also have no school and "no nothing" One may eliminate formal failure, in the sense that no one is given a failing mark or fails of promotion to the next grade, and one may eliminate formal competition, in the sense that one group is not designedly put in competition with another, but where there is ego there are failure and competition However, we can eliminate failure and competition of a kind, and many schools have done so, and apparently with some salutary results

Standards Professor Elsbree has recently given lucid expression to a point of view maintained by some in present-day education relative to the bearing of certain school practices on the personality of the pupils [86] It is argued by the adherents of this school of thought that the graded system of education, which has been in vogue in America for about a hundred years, has undesirable consequences for the mental hygiene of the pupils

As our schools are now organized pupils are typically admitted to the first grade on the basis of chronological age In a former period in which the school's function was accepted to be very largely that of teaching subject matter this was unquestionably an undesirable practice, since pupils differ so widely in ability to learn Under the philosophy that the school's principal concern is the teaching of academic subject matter there is no particular objection to a graded system, indeed, there is much to be said in its favor For some years since, educators generally have recognized that the school's function goes much beyond the teaching of the subject matter of the academic curriculum Every aspect of the mental development of the child is now conceived to be the school's rightful concern – his emotional development, his social behavior, his adjustment to school life, his physical development and all other educable aspects of his upbringing It is maintained that the realization of these objectives is thwarted by the promotional system which attends the graded system

If schools adhere strictly to six as the age of admission, that

[86] W S Elsbree, "School Practices That Help and Hurt Personality," *Teachers College Record,* 1941, Vol 43, pp 24–34

is if a child must have attained his sixth birthday before he is eligible for admission, the average age of the pupils upon entrance to the first grade is six and one half, if mid-year promotion is not practiced If this situation prevails, we may infer, from other data (Chapter IX) that approximately 16 per cent of these pupils, or almost one in six, have *M A*'s not exceeding five years and six months Authorities in reading maintain that a pupil should have an *M A* of about 6 6 in order to learn to read successfully [37] Of course, this can only mean that he should have attained an *M A* of this magnitude in order to proceed in accordance with the standards of reading set up for the first grade and by the prevailing methods of instruction By this situation then a large percentage of the first grade pupils are doomed to failure by our present practices and will be required to repeat the grade [38] (*cf* Chapter XII)

Such failure, it is pointed out, means loss of status, parental disapproval, a sense of inferiority, loss of companions, discouragement, and so on And there is little doubt that these allegations are supportable Elsbree makes the point that in graded schools the threat of nonpromotion fosters feelings of inadequacy in a considerable percentage of pupils

One system which seems to have much to commend it provides for the elimination of grades and promotions for the first three years This does not mean that all pupils will at the end of three years be ready to do fourth grade work by the present standards But it does have certain advantages, particularly in that it gives pupils who get off to a slow start in reading, assuming that they have the mental capacity to come up to the prevailing standards, a chance to right themselves before the day of reckoning comes round It also gives the teacher greater freedom in deciding when a pupil should start to learn to read since there is no particular urgency to get him up to a certain standard of proficiency by the end of the first year

[37] See A I Gates, "The Necessary Mental Age for Beginning Reading," *Elementary School Journal*, 1937, Vol 37, pp 497–508

[38] In a survey of several large cities Myers finds that from ten to fifteen per cent of the pupils in the elementary schools fail each year V C Myers, "The Child Who Fails," *Education*, 1937, Vol 57, pp 306–309

By all odds retardation, occasioned by failure of promotion, is a serious matter It is certainly an unfortunate experience It would be ideal if all the difficulty could be resolved (by its abolition) by administrative fiat Passing dull children along with their own age group from grade to grade, without regard to their accomplishments, creates some serious problems too The further they go the further behind they get The choice is really one between two evils The same problems exist, but to a lesser degree, with respect to extra promotions for gifted children Perhaps each case should be settled on its merit Let us reiterate a point made in Chapter III, namely that a child does not necessarily profit from group contacts because he is a physical member of a group He profits to the extent that he is accepted, taken in, on a give-and-take basis This is something that cannot be decided in the superintendent's office The person making the decision for a particular child should know that child Other things being equal, we should vote against extra promotions and failure of promotion Since things are not always equal, it would seem likely that there are cases in which either of these practices is desirable We sometimes talk about keeping groups intact as if we supposed all children of the same age were the same size, and were at the same place in their emotional and social development [39]

Something of the same reasoning applies to marking systems If we accept with Thomas that all pupils desire recognition, security, and response from others and, contrariwise, that the want of them is a constant torment, then it must be allowed that marking systems lead to unhappy consequences on the part of a large number of pupils Obviously if the system of marking is at all rigorous, only about a fourth of the pupils can earn high marks, a like number must earn low marks, and about one-half, average marks A fourth of our pupils, approximately, earn *I Q*'s of less than 90 By a rigorous marking system most of these pupils are doomed to low marks No matter how hard they try the result is the same (*cf* Chapter XII) It is argued,

[39] See I Parker, "Personality Problems and Reading Disability," *Nineteenth Yearbook of the National Elementary Principal*, 1940, pp 603–610

and justifiably so, that there should be some marks or some forms of appraisal that signify merit rather than defeat, attainable by all pupils A better system of rewarding effort, so that pupils may derive more satisfaction from trying, should lead to better adjustment, even if not to greater achievement

Much is to be said in favor of the informal report card or letter in which the pupil is appraised in terms of his efforts and the ratio between his accomplishment and his ability This type of report has the further merit of encouraging teachers to make a fuller report than that normally made under a letter or percentage system of marking Here the pupils' work habits, social adjustment, attitudes, effort, citizenship, and the like can be appraised, and attention can be called to certain helpful measures in which parental co-operation can be enlisted [40]

The foregoing considerations have much to commend them, although there is no perfect solution to these problems They are always with us It is a question too of how far we can go in this direction and maintain the lifelike aspects of our schools Pupils must, when they grow up, live in a tough, competitive, realistic world In life after school the individual is not rewarded much for effort His accomplishments are appraised realistically rather than otherwise The lad who sells papers on the street corner is rewarded in proportion to the number of papers sold, not in proportion to the number divided by some measure of his ability One of the most important lessons a pupil can learn is that of evaluating himself adequately This is a necessary foundation to adequate personal adjustment If he does not read or cipher so well as others he ought to know it, and he probably will without our constantly reminding him of it If he lacks the capacity to do much about it he shall have to live with this fact all his days However, we should not add to his discouragement by pressure to progress beyond his capacity While maintaining that a pupil should evaluate his academic capabilities realistically, we should also bend our

[40] See P M Symonds, "Marks and Examinations as Factors in Personality Adjustment," *Fifteenth Yearbook of the National Elementary Principal*, 1936, pp 355–363

efforts to provide recognition through compensatory activities so as to preserve, in so far as possible, his sense of adequacy and security

There is another angle to marks and reports Parents need to be realistic about the progress of their children Their plans for the future of the children demand this "Satisfactory progress" is one thing when by it is meant progress in respect to normal educational standards, it is another thing if it means satisfactory for "him" or "her" There is something to be said in favor of the practice of grading achievement, for purposes of motivation, in terms of the ratio between capacity and accomplishment Again the informal letter seems to be preferable to the report card for this purpose However, after the school has thoroughly assessed the pupil's assets and capabilities, perhaps within the first two or three years, the parents should be given a realistic appraisal and prognostication, in so far as academic achievement is concerned This is not an easy task But it must be admitted that there are now sufficient educational resources to enable us to do this with reasonable accuracy If it be admitted that the parents have a right to know, it becomes a task we cannot well escape If, of course, the more conventional methods of marking are employed, this ceases to be so urgent a matter [41]

The Curriculum Within recent years educators have begun to consider the curriculum in the light of its probable effect upon student personality This is a concomitant of the educa-

[41] *Cf* R O Evans, *Practices, Trends, and Issues in Reporting to Parents on the Welfare of the Child in School* New York Bureau of Publications, Teachers College, Columbia University, 1938 B M Grier, "Elementary School Report Cards," *Bulletin University of Georgia*, 1936, Vol 36, pp 9 ff R Hansen, "Report Cards for Kindergarten and Elementary Grades," U S Department of Interior, Office of Education, Leaflet No 41, 1931 P M Symonds, *op cit*

For references on the effects of non-promotion the reader is referred to the following E S Farley, *et al*, "Factors Related to the Grade Progress of Pupils," *Elementary School Journal*, 1933, Vol 34, pp 186–193 T E Moore, "Grouping Pupils According to Their Abilities and Needs," *Nineteenth Yearbook of the National Elementary Principal*, 1940, pp 614–620 M I Preston, "The School Looks at the Nonreader," *Elementary School Journal*, 1940, Vol 40, pp 450–458 F J Weersing, "No Failure Program," *School Review*, 1938, Vol 46, pp 331–333 *Cf* Chapter XII

tional philosophy that school is life as well as preparation for life This viewpoint has already been described and endorsed There is agreement that the school should be as lifelike as is consistent with good instruction It is probable that we have not exhausted the possibilities in this direction But some caution is demanded, as Buswell, for one, has pointed out The fact that unorganized, unsystematic lifelike experiences are inadequate for educational purposes makes schools necessary Lifelikeness is not *ipso facto* a good model [42] Schools should be lifelike in so far as this is consistent with systematic, organized learning It should be recognized in any case that it is the school's obligation to bring the pupil to grips with the cultural history of the race, that there is a rich body of knowledge, acquaintance with which is one of the conditions to one's becoming an educated person Moreover, our schools should strive to be vastly superior to other instructional agencies, and indeed they are The task of mastering the tools of civilization — graphic and oral language, number, economic and social organization, rights and obligations, the moral code, facts of science, and the like — to a degree necessary for successful living requires forthright teaching and learning, and preferably lifelike teaching and learning, but nevertheless, teaching and learning

Perhaps the de-emphasis of speed of work would usher in a valuable reform Many pupils undoubtedly experience defeat and discouragement because they are not so quick as others are Perseverance, patience, trial and error exploration, the development of habits of resourcefulness often lead to success where otherwise effort leads but to failure This should lead to confidence in ability to succeed after a while, if not immediately Removal of undue reward for speed should have the effect of encouraging persistent, resourceful effort

Arithmetic is particularly challenging from the standpoint of personality and adjustment because of the definitive character of the work The pupil understands the procedures or he does not, he gets the right answer or the wrong one Admittedly

[42] G T Buswell, "The Function of Subject Matter in Relation to Personality," *Sixteenth Yearbook of the National Council of Teachers of Mathematics*, 1941, p 13

this is overdrawn a bit, for there are degrees of understanding and some wrong answers are worse than others But in no other subject in the elementary school are success and failure so clear-cut Reading is also especially important It is one of the first serious academic tests to which the pupil is put It is the first barrier to his promotion, and by the time he reaches the intermediate grades reading deficiencies constitute a serious handicap to the successful prosecution of nearly all subjects of the curriculum [48]

The rise of the public high school in America has aggravated the problem of individual differences and the related problem of adjustment In the early days of this institution its function was largely college preparatory The curriculum was quite rigid Whether or not there was any justification for a rigid curriculum even then is debatable, but the matter of elasticity was not then so urgent as at the present time, since now more than 70 per cent of the boys and girls of high school age in this country are in high school, or were before the war years Obviously a majority of the graduates do not attend college Moreover the fact that such a large percentage of the population of high school age is in high school means the high school is much less selective, by ability, than formerly, and that a large percentage of high school pupils by reason of the character of their cultural background are lacking in spontaneity of interest in the traditional curriculum Thus many such pupils are faced with defeat and a sense of the futility of their efforts, in such a curriculum, almost from the start As is pointed out in Chapter I, education in America has been put forward as an opportunity — as a means of raising the cultural level of whole segments of the population This necessarily means that the schools must go much beyond the cultural and educational levels of a large percentage of the homes and communities from

[48] *Cf* P Blanchard, "Reading Disabilities in Relation to Difficulties of Personality and Emotional Development," *Mental Hygiene*, 1936, Vol 20, pp 384–413 C T Gray, "Reading Ability and Personality Development," *The Educational Forum*, 1940, Vol 4, pp 133–138 E P O'Reilly, "Preventing Maladjustment by Providing for Individual Differences," *Fifteenth Yearbook of the National Elementary Principal*, 1936, pp 340–347

which the pupils come Thus a large percentage of our high school pupils are ill prepared not only from the standpoint of very important early training for the things they are expected to learn but also from the standpoint of interest in learning it [44] They lack the requisite socialized anxiety to give impetus to learning the content of the traditional high school courses

As one attempt to meet this condition high schools have turned to vocational courses This is an important step, but from a psychological standpoint the job is by no means done Particularly the respectability of these courses needs to be built up Too often the pursuance of such a curriculum is a symbol of incompetence Moreover the cultural content of the courses could be vastly improved The cleavage between the vocational and liberal arts curricula should be eliminated In fact the latter was once a vocational curriculum, and for that matter, is still so to a large degree Latin, the quintessence of culture, was at one time quite definitely a vocational course Judd, for one, has maintained that along with vocational education should go thorough training in the history and meaning of American social institutions [45] Courses in vocational education could well become articulating activities (as described in Chapters XIII and XVI) for instruction in a variety of other courses, activities that would make this instruction both meaningful and challenging

Music, art, and literature and feelings of adequacy It is of some consequence to feelings of adequacy to be identified with the best in our culture Music, art, and literature have high prestige value Excellence in performance in art or music serves compensatory purposes, and appreciation and enjoyment of music, art, and literature should surely foster a sense of adequacy Since there is not much correlation between

[44] *Cf* N Edwards, "The Adolescent in Technological Society," *Adolescence,* Forty-third Yearbook, Part I, Chapter X, National Society for the Study of Education Chicago Department of Education, University of Chicago, 1944

[45] C H Judd, *Educational Psychology,* Chapter XX Boston Houghton Mifflin Co , 1939 See also J D M Griffin, S R Laycock and W Line, *Mental Hygiene a Manual for Teachers,* Chapter IX New York American Book Co , 1940

achievement in music and art and aptitude for academic learning, we have here possibilities of considerable value for personal adjustment, as interest in these areas leads to wholesome and successful defense of the feelings of self-regard [46]

Extra-curricular activities In considering this question cognizance should also be taken of the fact that it is not alone the slow learning pupils who suffer from inferiority feelings There are physically handicapped children, those from unfavored social and occupational groups, and a host of others who, owing to unfortunate childhood experiences and perhaps innumerable unknown causes, are in need of additional opportunity for "recognition, security, and response from others" In fact all pupils should be encouraged to participate liberally in school functions other than those of the standard curriculum, for their socializing effects In some of the more efficient schools today pupils scarcely distinguish the so-called curricular and extra-curricular activities For example, recess is regarded as an educational function where each child is supposed to do his part just as he is expected to do in the social studies or arithmetic class Unfortunately, as seen in Chapter XII, the general tendency in our high schools is that those most in need of participation in extra-curricular activities participate in them least

At the high school level the various extra-class functions are particularly important because of the recognition and prestige they command The athletic program, dramatics and music, public speaking, and student government are activities in which pupils may develop their resources and win recognition and security Perhaps public speaking, if the pupil can be brought to some degree of competence therein, should be very nearly a specific against timidity and lack of confidence In fact much of the embarrassment and diffidence displayed in social situations seems to arise from a lack of verbal control over those situations Mastery over an audience situation and the ability to

[46] M E Camburn, "Personality Enters the English Class," *Clearing House*, 1939, Vol 13, pp 419–421 H J Eysenck, "Some Factors in the Appreciation of Poetry, and their Relation to Temperamental Qualities," *Character and Personality*, 1940, Vol 9, pp 160–167 M E Rappaport, "Literature as an Approach to Maturity," *English Journal* (high school and college edition), 1937, Vol 26, pp 705–714

maintain one's poise and to make a skillful verbal defense of his actions and opinions should go a long way toward restoring and maintaining self-confidence Public speaking and argumentation should prove to be of the greatest worth to the timorous pupil

Pupil participation in school management has certain important advantages from a disciplinary standpoint in addition to those mentioned above Needless to say there is found in practice almost every conceivable variety of pupil participation and as many different degrees of success But taken at its best it has the particular merit of focusing attention on the proper aspects of the problem of pupil conduct The standards of conduct are set by the pupils for the good of the group Infractions may be looked upon as trespass upon the rights and welfare of the group, not merely the wishes of the instructional and administrative staff Assumption of responsibility for one's conduct, and sensitization to group authority are important features of growing up For the realization of this objective the excessive use of fixed rules should be avoided

As our schools have come to realize the educational importance of extra-curricular activities there has been a tendency to give them status as curricular activities This recognition of the importance of student government, public speaking, athletics, student publications, and the like is very fine, but there is the threat that as they are given curricular status they may be so subjected to administrative and faculty control and organization as to destroy much of their value Something of the same thing has, in certain instances, happened in the case of supervised play [47]

Problem children From the standpoint of causal antecedence one form of behavior is as normal as another Behavior becomes a problem, and the child displaying it becomes a problem child, when deviation from the norms of conduct becomes sufficiently marked to require corrective measures

[47] The reader's attention is called to a recent monograph devoted to the subject of student participation in school management, by Ellen B Brogue and Paul B Jacobson "Student-council Handbook," *Bulletin of the National Association of Secondary-school Principals*, 1940, Vol 24, No 89 Various methods and practices are described and results appraised

From one standpoint a child is recognized as being a behavior problem when his conduct, with some degree of regularity, is antisocial, unethical, or otherwise deviates from the norm in traits that are recognized as being socially important From another standpoint a child is regarded as a problem when his conflicts and frustrations are not adequately resolved, with the result that he continues to live in a state of emotional turmoil Some writers, for example Ackerson, who make a distinction between behavior problems and personality problems, designate the latter as personality problems [48]

(1) *Incidence of behavior problems* Since there is no uniform standard of "problemness" naturally it is impossible to say precisely what the incidence of behavior problems is, or what percentage of the children are problem children Bennett has recently summarized some of the available literature bearing upon this subject [49] Accordingly, the U S Children's Bureau finds that more than 100,000 juvenile delinquents are added to the list of offenders annually The Massachusetts Child Council reports court appearances for the year 1937 to be in the ratio of 9 1 1000 for the ages of 7 to 16 years Wiers found the ratio in Michigan to be 8 4 1000 for the ages 10 to 16 years Woodbury estimated upon the basis of cumulative incidence that 83 5 white boys per thousand become delinquent by their sixteenth birthday For white girls the figure stands at 12 2 per thousand, for colored boys 289 8, for colored girls 63 3 [50] Undoubtedly some of the discrepancy between white and colored children is due to greater readiness to bring colored children to trial than is the case with white children Upon the basis of limited data it is suggested that about 10 per cent of school children are regarded as problem cases by their teachers Macfarlane finds that "no normal child is com-

[48] J E Bentley, *Problem Children,* New York W W Norton and Co , 1936 See M Sherman, *Conflicts and Personality,* New York Longmans, Green and Co , 1938 E K Wickman, *Children's Behavior and Teachers' Attitudes* New York Division of Publications, The Commonwealth Fund, 1938 L Ackerson, *Children's Behavior Problems* Chicago University of Chicago Press, 1931

[49] C C Bennett, "Problem Children, Delinquency, and Treatment," *Review of Educational Research,* 1940, Vol 10, No 5, Chapter VI

[50] Data from Bennett

pletely free of adjustive devices that get labeled as 'behavior problems'" [51] At the preschool level she reports that the average number varies from 4 to 6 per child for the various age levels [52]

An investigation by Haggerty supplies some interesting data on the relationship between the incidence and rated seriousness of behavior problems on the one hand and chronological age on the other [53] The scores are weighted upon the basis of frequency of occurrence and seriousness as rated by teachers The results are given in Table XIV

TABLE XIV

RELATIONSHIP BETWEEN BEHAVIOR SCORES AND CHRONOLOGICAL AGE

	Average Scores	
C A	Boys	Girls
6	10 4	5 1
7	17 1	4 2
8	6 1	4 4
9	11 9	6 8
10	10 5	6 5
11	15 1	7 3
12	13 3	6 1
13	9 9	8 7
14	6 6	4 9
15	5 4	5 8
16		4 0
17		0

[51] J W Macfarlane, "Study of Personality Development," in *Child Behavior and Development*, Chapter XVIII, R G Barker, J S Kounin, and H F Wright (editors) New York McGraw-Hill Book Co, Inc, 1943

[52] *Cf* L B Murphy, "Social Behavior and Child Personality," in *Child Behavior and Development, op cit*, Chapter XX L K Frank, "The Adolescent and the Family," *Adolescence, Forty-third Yearbook, op cit*, Chapter XIII

[53] M E Haggerty, "The Incidence of Undesirable Behavior in Public-school Children," *Journal of Educational Research*, 1925, Vol 12, No 2

(2) *Seriousness of problems* Wickman, in the investigation previously cited, had a group of 511 elementary teachers rank a list of 50 more or less common problems in the order of their seriousness [54] These rankings were then compared with those made by a group of 30 mental hygienists Among the problems receiving a high ranking by the teachers are *stealing, obscene notes* and *talk, untruthfulness, truancy, impertinence,* and *defiance, cruelty* and *bullying, cheating,* and *destroying school materials* Among those receiving low seriousness ratings are *unsocialness, interrupting, inquisitiveness, criticalness of others, tattling, whispering, sensitiveness, restlessness, shyness* The mental hygienists gave top ranking to the following *unsocialness, suspiciousness, unhappiness, resentfulness, fearfulness, cruelty* and *bullying, discouragement, suggestibleness, criticalness,* and *sensitivity,* and the lowest ranking to *disobedience, tardiness, inquisitiveness, destroying school materials, disorderliness in class, profanity, interrupting, smoking,* and *whispering* In a similar investigation Dickson obtained seriousness ratings by 24 psychologists and a group of teachers [55] On the whole his results confirm those of Wickman To the same purpose are investigations reported by Stogdill [56] and Yourman [57]

Generally speaking, it is not the behavior but what it is symptomatic of that is of the greatest significance It is not the social consequences but the *motive* that should be uppermost The mental hygienist by reason of his greater insight into the meaning of the symptoms attaches greater significance to sensitiveness, unsocialness, depression, fear, timidity, and related manifestations than does the teacher In many school systems a teacher is judged to a considerable extent by the kind of order he keeps in the classroom Where this situation prevails,

[54] Wickman, *op cit*

[55] V E Dickson, "Behavior Difficulties that Baffle Teachers," *Journal of Juvenile Research,* 1932, Vol 16, pp 93–101

[56] R M Stogdill, "Attitudes of Parents, Students, and Mental Hygienists toward Children's Behavior," *Journal of Social Psychology,* 1933, Vol 4, pp 486–489

[57] J Yourman, "Children Identified by Their Teachers as Problems," *Journal of Educational Sociology,* 1932, Vol 5, pp 334–343

the teacher will naturally view whispering and similar disturbances with some alarm But at the same time there is room for greater awareness upon the part of teachers of the seriousness of certain symptoms that do not cause overt disturbances in the classroom Then, too, in many instances the overt disturbances are probably traceable to group moves, and need not have any special emotional significance

We cannot here enter into a discussion of the various disposing factors Sociological, economic, and familial factors have been studied with some care The reader's attention is called to the investigations of Barker,[58] Shaw,[59] and Maller [60] on neighborhood conditions Anderson's [61] review of the literature on the family situation in adjustment and Ojemann's [62] on the community are also cited The relationship between delinquency and test intelligence has been reviewed by Owen,[63] Fenton and Wallace,[64] Krugman,[65] Williams,[66] and Williams [67] Edwards' article, "The adolescent in technological society," previously cited, is also appropriate to this problem

(3) *A suggestion to the teacher* Some teachers are inclined

[58] G H Barker, "Family Factors in the Ecology of Juvenile Delinquency," *Journal of Criminal Law and Criminology*, 1940, Vol 30, pp 681–691

[59] C R Shaw, *Delinquency Areas* Chicago University of Chicago Press, 1929

[60] J B Maller, "Juvenile Delinquency in New York City," *Journal of Psychology*, 1937, Vol 3, pp 1–25

[61] H H Anderson, "Adjustment in the Family Situation," *Review of Educational Research*, 1940, Vol 10, pp 414–420

[62] R H Ojemann, "Adjustment in the Community," *Review of Educational Research*, 1940, Vol 10, pp 429–434

[63] M B Owen, "The Intelligence of the Institutionalized Juvenile Delinquents," *Journal of Juvenile Research*, 1937, Vol 21, pp 199–205

[64] N Fenton and R Wallace, *State Child Guidance Service in California Communities* Sacramento California Bureau of Juvenile Research, 1938

[65] M Krugman, "A Comparison of Distributions of Clinic and Unselected Children on the Stanford-Binet Intelligence Examination," *American Journal of Orthopsychiatry*, 1939, Vol 9, pp 319–324

[66] J H Williams, "Behavior Problems and Delinquency," *Review of Educational Research*, 1936, Vol 6, pp 499–513

[67] H M Williams, 'Intelligence and Delinquency," *Intelligence Its Nature and Nurture*, Thirty-ninth yearbook, Part I, National Society for the Study of Education Bloomington, Ill Public School Publishing Co, 1940

to see a pupil as aggressive, stubborn, or lazy, without realizing that he is making a perfectly natural response to the situation as he sees it Teachers should consider the circumstances that lead to a given type of behavior and try to analyze the situation in question as it appears to the pupil They should ask, "What function does this behavior serve him?" In order to help him they must see the situation as he sees it, not as they themselves see it

Co-operation and competition The school environment presents a host of problems to the pupil Up until the time the child enters school he lives a comparatively sheltered life For a number of reasons the school environment makes rather rigorous demands upon him He cannot choose his classmates, but must live successfully or unsuccessfully with them Competition with respect to friends, school honors and achievement, and social recognition is rather keen Not yet being thoroughly schooled in the social graces, children are frequently rather cruel to their less fortunate associates

Many children enter school life with obvious handicaps Some are confirmed behavior problems, others are emotionally unstable, crippled, malnourished, defective in seeing or hearing or in speech, or limited in mental ability The committee reported to the White House Conference on Child Development and Protection in 1930 that there were three million children in the United States with impaired hearing, one million between the ages of five and eighteen so defective in speech as to require remedial treatment, three hundred thousand crippled children, six million children (approximately) of school age who were malnourished Approximately one child in four has an *I Q* of 90 or less The number of children who are frail, slight of build, or who owing to other physical conditions are so lacking in vigor and robust health that they cannot participate with their fellows on equal terms, is doubtless large Thus the children are legion who compare unfavorably from the start with those with whom they must compete

It is, perhaps, safe to say that pupils generally have good intentions toward their fellows It seems likely that a good deal could be done in the way of cultivating attitudes of mutual

helpfulness and friendliness among them Chittenden's investigation of the effects of training in co-operative behavior in young children is highly suggestive [68] Training in "taking turns," "using toys together," and "sharing" resulted in a reduction of aggressive behavior It is reasonable to suppose that the practice of co-operative assignments and of co-operative execution of assignments, now found in many schools, serves to reduce somewhat the competitive aspects of school life and makes for a greater sense of security In such an enterprise it is desirable that each child be led to feel that he has had a share in the work The work of Lewin, Lippitt, and White, in which the behavior of 10-year-old boys under democratic leadership is compared with that under autocratic leadership, is also suggestive [69]

There is little doubt that the school adds to the pupil's burden of emotional adjustment This point is emphasized over and over in the literature, and does not require reiteration here However a point may be made of the probability that the school can actually foster emotional adjustment, just as it is also a means of destroying it In all probability the school has always served this function to a degree However, it has doubtless not realized its full possibilities in this direction By concerning itself positively with the problem of adjustment, that is, by contriving to provide the conditions necessary for good emotional and social adjustment instead merely of trying to eliminate those conditions that are detrimental, the school may move into a sphere of greater usefulness

TEACHER ADJUSTMENT

The teacher as an individual is entitled to that measure of happiness that comes from successful emotional adjustment This congenial state of affairs is attainable only if the teacher has confidence in his ability — feels adequate — respects his vocation, and feels secure in his relationships with one or more

[68] G E Chittenden, "Measuring and Modifying Assertive Behavior in Young Children," *Doctor's Thesis* State University of Iowa, 1941

[69] K Lewin, R Lippett, and R K White, "Patterns of Aggressive Behavior in Experimentally Created 'Social Climates,'" *Journal of Social Psychology,* 1939, Vol 10, pp 271–299

persons "It seems a necessity that every adult should have close proximity through visit, letter, or actual habitation, with one or more persons from whom he would get this sense of security" [70]

Success is the price of adequacy One comes by his appraisal of himself as a teacher, just as he does in any other sphere of life, in large measure from the reactions of others toward his teaching, chiefly from the reactions of his pupils and colleagues One also places a value upon his teaching by comparing his achievements with his ideals In the latter respect the hampering influence of state and city wide curricula and supervisors may sometimes thwart a good teacher in the realization of his ideal, and may stand as a rationalization for the failure of a poor teacher Supervisors and state courses of study are at their best with the mediocre teacher They may actually hamper the enterprising teacher

For the sake of his feeling of adequacy the teacher should succeed as a teacher, although a measure of compensation is attainable through community service This may at least make his position secure if it does not add to his feeling of adequacy Some teachers doubtless feel that by community service they may become identified with the social life of the community — a very worthy ideal In some cases this probably occurs But it is of the greatest consequence to the teacher's adjustment that he not mistake "acceptance as a willing community servant" for "social acceptance in the sense of belonging"

Perhaps teachers are as well adjusted as any other group But like other groups they have certain problems that are peculiar to their profession, not the least of which is their lack of full social acceptance Teachers are usually regarded in some respects as being superior, in others as inferior, but rarely as an equal Children are exhorted to be on particularly good behavior when the teacher is present The topic of conversation in almost any group is likely to take a turn for the "better" when the teacher joins the party As Waller has said, men do not practice their normal vices in the presence of male teachers This is unfortunate in that it is symptomatic of the

[70] Plant, *op cit*, p 287

fact that they are not fully accepted as members of the "in groups" Until such acceptance is achieved by both men and women teachers, teachers will probably continue to represent a stereotype in the attitude of the public

Teachers should strive to establish themselves as specialists They should seek to disestablish themselves as moralists, Sunday school leaders, and chaperons Certain communities, in their insistence that the teachers be models of conduct, throw such restrictions about the social life of teachers that they soon tend to take on such characteristics as to make them unacceptable as models to the youth In some communities women teachers dare not attend public dances, even though the daughters of the "best families" and other women of comparable status may do so with impunity

The teacher's first duty to himself is to win status with his fellow teachers, his pupils, and with the community He cannot succeed in the latter if he is culturally isolated The superintendent and principal can doubtless do a good deal in fostering a more desirable attitude toward teachers and assisting them in making better adjustments toward their social problems Both the teachers and the community could be better educated with respect to the importance of greater social free play

Teachers can do a great deal to put their own house in order They cannot afford to be poorly dressed even when they feel they cannot afford to be well dressed Having something to contribute to a group usually leads to acceptance by a group Ideally, teachers should seek companions outside their profession, should broaden their interests, enhance their general culture and knowledge as well as their professional competence They should cultivate the social graces and charm Perhaps teachers should play down their superior professional knowledge and play up their literacy in world affairs They should read widely and be well informed By broadening their sympathies with the social and intellectual life of the community and their literacy in world affairs and ever keeping alert to the social graces, teachers might well become indispensable to the social and intellectual life of the community By and large

teachers tend to arrive at their ultimate stature too quickly [71] They should continue to grow in wisdom as do men and women in other professions, and the administrative authorities and the community should provide the avenues of such growth [72]

The evidence at hand indicates that teachers as a general thing do not read a great deal, in comparison with other educated adults One palpable reason for this is the fact that they spend most of their time with their school work In the long run this is probably a mistake As a palliative it is suggested that teachers desist from the practice of taking work home with them The evening should be spent in recreation, in social activity, and in the reading of good books Undue attention to school work tends to have a narrowing effect Reading is not

[71] *Cf* P L Boynton, *et al*, "The Emotional Stability of Teachers and Pupils,' *Journal of Juvenile Research*, 1934, Vol 18, pp 223–232 R L Finney and L D Zeleny, *An Introduction to Educational Sociology* Boston D C Heath and Co, 1934 *First Yearbook of the John Dewey Society, The Teacher and Society* New York D Appleton-Century Co, 1937 F Hicks, "The Mental Health of Teachers," *Contributions to Education*, No 123 Nashville George Peabody College, 1934 I Milhous, "The Reactions of Des Moines Teachers to Various Factors in their Occupational and Living Environment," *Doctor's Thesis* State University of Iowa, 1940 M Phillips, "Some Problems of Adjustment in the Early Years of a Teacher's Life," *British Journal of Educational Psychology*, 1932, Vol 2, pp 237–256 L Peck, "A Study of the Adjustment Difficulties of a Group of Women Teachers," *Journal of Educational Psychology*, 1936, Vol 27, pp 401–416 W Waller, *The Sociology of Teaching* New York John Wiley and Sons, Inc, 1932

[72] There are a number of good sources on the general problem of personality and adjustment not cited in the foregoing pages The following are listed as additional references

B Baxter, *Teacher-pupil Relationships* New York The Macmillan Co, 1941 *Child Development and the Curriculum*, Thirty-eighth Yearbook, Part I, National Society for the Study of Education Bloomington, Ill Public School Publishing Co, 1939 N Fenton, *Mental Hygiene in School Practice* Stanford University (Calif) Stanford University Press, 1943 F McKinney, *Psychology of Personal Adjustment* New York John Wiley and Sons, Inc, 1941 "Mental Hygiene and Health Education," *Review of Educational Research*, 1943, Vol 13, No 5 *Mental Hygiene in Modern Education* (P A Witty and C E Skinner, editors) New York Farrar and Rinehart, Inc, 1939 C R Rogers, *Counseling and Psychotherapy* Boston Houghton Mifflin Co, 1942 *Studies in Personality* (Q McNemar and M A Merill, editors) New York McGraw-Hill Book Co, Inc, 1942 K Young, *Personality and Problems of Adjustment* New York F S Crofts and Co, 1940

only the best way but it is almost the only way of becoming a liberally educated person Perhaps there is no other one thing within the teacher's power that will do so much to establish in him a sense of competence and personal worth, or will make his life seem so important, as a substantial education

CHAPTER IX

THE MEASUREMENT OF INTELLIGENCE

HISTORICAL INTRODUCTION

The measurements movement may be said to have been initiated by Francis Galton (1822–1911) The best known of his tests are those of sensory discriminative capacity, to wit, lifted weights and the celebrated Galton whistle, and the questionnaire for studying mental imagery Galton's distinctive contributions to measurement lay, however, in another direction, namely in statistical method and test theory On the side of statistics he gave us the methods of standard deviation and correlation, although the latter was a bit crude On the side of theory he proposed, as a means of obtaining a general knowledge of the capacities of a man, the procedure of "sinking shafts, as it were, at a few critical points," and of ascertaining the best points for the purpose by comparing the measures "with an independent estimate of the man's powers" [1] Here Galton clearly anticipated Binet's methods of sampling and of determining validity

Galton's interest in individual differences and the great energy with which he put this interest forward must have contributed enormously to the awakening of a general interest in mental measurement In 1883 he wrote "The instincts and faculties of different men and races differ in a variety of ways almost as profoundly as those of animals in different cages of the zoological gardens " [2] Galton was, of course, a eugenicist, and as such was interested in improving human stock, "thus exerting ourselves to further the ends of evolution more rapidly and with less distress than if events were left to their own course" Such a program naturally led to the consideration of means of measuring mental faculties

[1] F Galton, "Remarks on Mental Tests and Measurements," *Mind*, 1890, Vol 15, p 380

[2] F Galton, *Inquiries into Human Faculty and Its Development*, p 2 New York E P Dutton and Company, 1883

His observations had led him to believe that "capacity for labor" and sensory acuity were two important abilities transmissible by descent Perhaps his tests of sensory capacity, mentioned above, and his use of the dynamometer and tests of reaction time were outgrowths of these observations Incidentally, the tests themselves proved to be quite inadequate except at lower levels

Another notable figure in the early history of mental testing was Cattell Peterson has suggested that he was the first to employ the term *mental test* His most important contribution to mental testing lay in his standardization of procedure in administering and scoring the tests Perhaps his interest in standardization of procedure influenced in a considerable measure his choice of tests [3] Most of the tests employed by him were adaptations of experimental techniques that had previously found their way into psychological laboratories Several such tests administered to 100 Columbia University freshmen, as described in an article published in collaboration with Farrand in 1896, investigated [4] keenness of vision and hearing, reaction time, after-images, color vision, perception of pitch and weights, sensitivity to pain, color preferences, perception of time, accuracy of movement, rate of perception and of movement, memory, and mental imagery

In 1901 Wissler published the results of a statistical analysis of the Cattell-Farrand data The intercorrelations between the tests were low, ranging from — 28 to 39 Theoretically, this in itself does not constitute a limitation to the tests Ideally, such tests should correlate highly with independent criteria and lowly with one another Actually, this ideal has not been approximated very closely because it has turned out that most tests that correlate highly with the criteria also correlate highly one with another A more telling blow was Wissler's finding that the tests correlated to an indifferent degree with marks earned in academic subjects, although significant intercorrela-

[3] J Peterson, *Early Tests and Conceptions of Intelligence* New York World Book Company, 1925

[4] J McK Cattell and L Farrand, "Physical and Mental Measurements of the Students of Columbia University," *Psychological Review*, 1896, Vol 3, pp 618–648

tions were obtained between the marks earned in the various subjects [5]

It is clear now, although not so then, that Cattell sacrificed validity in the interest of precision of measurement Other workers, notably Oehrn and Kraepelin (1889), had attempted measurement of the more complex mental processes, as, for example, perception, memory, and association [6] In 1906 Terman, in a study of the mental abilities of "bright" and "stupid" boys, made use of tests designed to measure such functions as (1) inventive or creative imagination, (2) logical processes, (3) mathematical ability, (4) language ability, (5) insight, and (6) memory [7]

Binet The genius of Alfred Binet was turned to intelligence testing in 1894, or shortly beforehand, as seen in several articles published in that year Within this and the three succeeding years followed seven articles describing research conducted in collaboration with V Henri, which appeared for the most part in *Revue Philosophique* and *L'Année Psychologique* Experimentation was carried on with various tests designed to measure memory, mental images, imagination, attention, comprehension, suggestibility, and with various physiological and anthropometric measures This experimentation was directed primarily toward determining the validity of the various tests This was done by ascertaining the extent to which they discriminated between groups of bright and dull children as selected by independent means, principally by teachers' estimates and grade placement For example, 15 or 20 different physical measurements were made of a group of boys whose modal age was 13 years It was found that the measures obtained were essentially unrelated to estimates of intelligence of the boys made by the head of the school The tests of suggestibility like-

[5] C Wissler, "The Correlation of Mental ond Physical Tests," *Psychological Review, Monograph Supplement,* 1901, Vol 3, Whole No 16

[6] *Cf* J Peterson, *op cit*, Chapter V New York World Book Company, 1925

[7] L M Terman, "Genius and Stupidity, a Study of Some of the Intellectual Processes of Seven 'Bright' Boys and Seven 'Stupid' Boys," *Pedagogical Seminary,* 1906, Vol 13, pp 307–373

wise proved to be unsatisfactory In fact some of them gave negative discrimination

Within the years 1894–1904 Binet had published some 35 articles and treatises on intelligence and its measurement In 1904 he was appointed by the Minister of Public Instruction to a commission to study the problem of teaching the subnormal pupils in Paris The decision to place these pupils in special schools created a need of a convenient, dependable measure of intelligence Binet addressed himself to the designing of such a test, in collaboration with Th Simon, and in 1905 the first Binet test made its appearance This was not an age scale as were the revisions in 1908 and 1911, but simply a collection of test items, 30 in number, ranked in order of difficulty, approximately, from those suitable to the mental ability of an infant to those suitable for adults The upper limits of idiots, imbeciles, and morons, the three grades of the feebleminded, were indicated The characteristics of a mental age scale are discussed presently

The Binet-Simon tests, which marked the beginning of intelligence testing in the modern sense, are undoubtedly to be numbered among the most outstanding contributions in the entire history of psychology These tests, as Garrett appropriately remarks, are still the prototype of the best modern scales for measuring intelligence Within a few years after their publication they were in extensive use in practically every major country in the world

Binet's contributions to intelligence testing from 1904 to 1911, the latter being the year of his death, are chiefly three First, he succeeded in devising measures of the so-called higher mental processes, such as imagination, judgment, attention, insight, and reason Second, he designed a measure of the general level of intelligence (not the level of general intelligence) by making use of a fairly large battery of heterogeneous test items and deriving a composite score He put into practice Galton's recommendation that shafts be sunk at certain critical points and that, in order to determine the points best suited to this purpose, the measures should be compared with an inde-

pendent criterion Third, Binet gave more exact formulation to the mental age concept by basing it specifically on test scores

Modern period in America Wissler's monograph proved to be something of a setback to testing in America When intelligence testing was revived, with Goddard's adaptation of the Binet-Simon scale in 1910, the movement went forward rapidly [8] Kuhlmann's first revision of the scale appeared in 1912, Terman's Stanford-Binet in 1916 The latter has enjoyed exceptionally wide popularity and just recently (1937) has set a new high standard in the "New Revision" [9] The second revision of Kuhlmann (1922) has proved to be a most satisfactory instrument, [10] and his third scale (1939) has much to commend it [11] For a fuller account of the nature and extent of these revisions and for accounts of other well-known revisions, the student is referred to the books that deal exclusively with intelligence testing [12]

Great impetus was given to intelligence testing during American participation in the first World War Subsequent to the declaration of war a committee of seven psychologists, with R M Yerkes acting as chairman, undertook and carried to completion the construction of a battery of group tests of intelligence Obviously the task of administering tests individually to the drafted men was prohibitive [13]

The well-known Army Group Examination Alpha in five forms was the principal contribution of the committee In practically all important achievements, for example the 1905 Binet-Simon scale, considerable preliminary work has gone

[8] H H Goddard, "The Binet-Simon Measuring Scale for Intelligence," *The Training School*, Vol 6, 1910, pp 146–154

[9] L M Terman and M A Merrill, *Measuring Intelligence* Boston Houghton Mifflin Co , 1937

[10] F Kuhlmann, *A Handbook of Mental Tests* Baltimore Warwick and York, 1922

[11] F Kuhlmann, *Tests of Mental Development* Minneapolis Educational Test Bureau, 1939

[12] Good sources are P L Boynton, *Intelligence, Its Manifestations and Measurement*, Chapter V New York D Appleton-Century Co , 1933, and F N Freeman, *Mental Tests* Boston Houghton Mifflin Co , Revised 1939

[13] *Cf* C S Yoakum and R M Yerkes, *Army Mental Tests*, pp 2–3 New York Henry Holt and Co , 1920

before The case at hand was no exception The members of the committee drew from several sources, but from none so extensively nor with such profit as from the work of A S Otis, who had at the time a group test in manuscript form The following captions will serve to give some indication of the type of test items utilized *following directions, arithmetical problems, practical judgment, synonym-antonym, disarranged sentences, number series completion, analogies,* and *general information* The Army Alpha battery has stood as a model for group intelligence tests to this day [14]

The mental age concept The mental age was the first unit of measurement employed in intelligence testing This may be characterized as follows The *M A* corresponding to a given intelligence test score is the average age of the standardization cases earning that score Thus an appraisal of a pupil's performance on an intelligence test is made by ascertaining the average age of the pupils (standardization cases) whose performance equals his own and comparing this age with his

The mental age concept appears to have been in the thinking of various writers well in advance of the advent of standardized intelligence tests Woodrow informs us that Duncan and Millard appear to have had the concept in mind in 1866, as witnessed by the following "It is a very striking method of showing the mental deficiency of a member of any one of these classes [of feebleminded] to compare its mental gifts with those of children of perfect mind at younger ages" [15] To the same purpose is the following statement by Down made in 1887 "In any given case we have to ask ourselves, can we in imagination put back the age two or more years and arrive thus at a time perfectly consistent with the mental condition of our patient? If he be a backward child we shall have no difficulty in saying what period of life would be in harmony with his state" [16]

[14] For reviews of recent intelligence tests the reader is referred to D B Stuit, "Current Construction and Evaluation of Intelligence Tests," *Review of Educational Research*, 1941, Vol 11, pp 9–24, and to O K Buros, *The Nineteen-forty Mental Measurements Yearbook* Highland Park, New Jersey The Mental Measurements Yearbook, 1941

[15] H Woodrow, *Brightness and Dullness in Children*, p 25 Philadelphia J B Lippincott Co , 1919

[16] *Ibid*

MENTAL AGE SCALES

In selecting items for a mental age scale there are certain practical considerations, such as time limits, interest value, administration and scoring, that must be taken into account Once the test designer has assured himself that his test items meet these practical considerations and that they have proven validity he is ready to proceed with the construction of a scale

Standardization cases One of the first steps is the selection of standardization cases, or the adoption of some principle by which they are to be selected Here the task is to draw a sampling such that each age group is representative of that age group in the general population It is clear that if this sampling is superior in ability to the population in general, the scale will assign mental ages that are too low when put into use The reverse will obtain if the standardization cases are inferior to the population in general

In the New Stanford Revision a total of approximately 3000 standardization cases were used, making from 150 to 200 cases per age level for the years 2 to 5, from 201 to 204 cases for the years 6 to 14, and from 101 to 109 for the years 15 to 18 The cases between the ages 6 and 14 inclusive were drawn entirely from school populations Wherever possible siblings of the school children were used as standardization cases for the pre-school levels An attempt was made to find schools patronized by people of average social status These were drawn from various communities in several different states Within each school all pupils, regardless of the grade in which they were placed, who were within one month of a birthday were made a part of the standardization group and were, therefore, tested by the trial battery As a partial check on the representativeness of the sampling, data were secured with respect to the occupations of the children's fathers The occupational distribution was found to compare rather well with that of the 1930 U S Census for employed males

Administration of trial battery The term *trial battery* is used here with some reservation The test designer begins

with a considerable knowledge of his test elements As is seen above, Binet had behind him 10 years of persistent research in the measurement of intelligence when he addressed himself to the task of constructing a scale Concerning the New Stanford Revision the authors state "Work on the revision was begun with a survey of the literature on the old Stanford-Binet and a study of every kind of intelligence test item that had been used or suggested" [17] By thorough acquaintance with the history of the test elements it is possible for a designer to know in advance a great deal about the merits of the elements that comprise the trial battery But in a mental age scale there exists the special problem of getting items of the right degree of difficulty for each age level For this reason, especially, the designer puts into his trial battery more items than he intends to use in the final battery This procedure gives him some leeway in the location of items

In the administration of the trial battery the procedure is carefully determined in advance and followed to the letter just as is done in the use of the scale afterward Moreover, the responses of the standardization cases, as made to each test element, are recorded verbatim This is of the greatest consequence in the location of the elements

Location of items In a mental age scale the norms are self-contained, as it were In this respect it differs from a point scale Since this is the case, the proper location of items is just as essential to the construction of an accurate scale as is the selection of standardization cases The fundamental problem is that of so locating the items that the median *M A* score equals the median *C A* of each age group of the standardization cases If this is done precisely (in practice it has only been very closely approximated) the average *I Q* of the standardization cases will stand at 100 If this condition obtains and if the standardization cases are exactly representative at each age level, the average *I Q* of the general population in which the scale is subsequently used will also stand at 100, at each age level

This arrangement is achieved by trial and error manipulation In some instances an item can be moved to a higher or a

[17] L M Terman and M A Merrill, *op cit*, p 7

lower age level In other instances it may be made more difficult or less difficult by alteration in the scoring For example, an item may be made more difficult by decreasing the time limit and, in some instances, by increasing the number of correct responses required for its passing

Standardization The principal feature of standardization of a test is the compilation of norms for the interpretation of scores Implied features are standard procedures in administration and scoring In practice the test is to be administered and scored exactly as done with the standardization cases If, in practice, the instructions and time limits are altered or if the scoring is too lenient or too exacting in comparison with those levied against the standardization cases, the results of careful selection of standardization cases and placement of items are vitiated Consequently standardization procedure implies that detailed instructions be provided for administration and scoring

As noted previously, in an age scale the norms are self-contained The norms become a part of the construction of the scale In a point scale the compilation of norms becomes an independent procedure

In age scales the scoring is commonly subjective to a degree The examiner must evaluate the responses In the opinion of some authorities this is a weakness In this opinion the writer does not concur If the tests are administered by competent, thoroughly trained examiners, there is something to be said in favor of allowing the examiner's judgment to figure in the interpretation of the responses

POINT SCALES

The term *point scale* has two different significations in intelligence testing On the one hand it is used to designate a type of scale in which varying amounts of credit are accorded the responses to an item, depending upon their merit, as in the Yerkes-Bridges-Hardwick Point Scale This practice opposes the all-or-none method of scoring employed in the Stanford-Binet scales On the other hand, group tests and all other tests that do not arrange items according to the age-scale method,

or express scores in years and months of credit earned are known as point scales Upon administering such a test to a pupil the number of items answered correctly is ascertained, the number of points earned This number becomes the pupil's raw score Such a score, by a table of norms, is then converted, without difficulty, into an *M A* score or some other form of derived score

The Kuhlmann tests The Kuhlmann *Individual Tests of Mental Development* incorporate both features of the point scales That is, they represent a point scale by both of the meanings of that term The test designer must exercise the same care in the selection of standardization cases for a point scale as for a mental age scale The norms are likely to be slightly more accurate than in the age scale because of the practical difficulty in achieving a precise location of the items in an age scale As a matter of fact the location of items at appropriate age levels is not a necessary step in the construction of an age scale Instead, the designer may find the age at which an item is passed by exactly 50 per cent of the standardization cases and assign the item that *M A* value

Kuhlmann used the latter method For example, for item 12 the age at which 50 per cent passed is 6 2, for item 13, 6 7, and so on Certain variations were required for the scoring of many of the items since partial credit was allowed

At the lower age levels, below the six-and-a-half-year level, the scoring is all-or-none as in the usual Binet procedure Above this point a variable amount of credit is allowed, depending upon the speed and quality of the response A pupil earns a certain credit for passing one trial (of an item) and additional credit for passing a specified number of additional trials In a similar way, he earns one amount of credit for a correct response made within a maximum time limit, and additional credit when made in a certain fraction of maximum time

In effect, a series of trials graded in difficulty comprises a scale in miniature for each item so treated Actually it increases the power of an item The same thing may be accomplished, of course, in an all-or-none method of scoring by increasing the number of items, although when this is done the

total testing time might be somewhat greater than that required under Kuhlmann's arrangement

Speed has been a controversial matter in intelligence testing since the advent of group testing, inasmuch as most group tests impose a rigid time limit Thus the speed of response is a factor in determining the total score earned On the other hand, a considerable body of psychological research has shown sheer speed of work — speed in tasks so simple that speed is the principal determinant of the total score — to be essentially unrelated to other measures of intelligence However, Kuhlmann makes the important observation that "*having shown that a speed test is a poor test proves nothing whatsoever about the value of a speed score in power tests*" [18] Above the age level indicated previously, the time spent in making a response as well as its accuracy becomes a part of the score His experimental results show that speed, instead of calling for little or no consideration, merits a weighting about equal to accuracy The importance of the speed factor is shown further in the finding that the correlations between speed and accuracy scores are usually negative and often quite high This finding, says Kuhnmann, shows "to what high degree speed and accuracy scores are mutually compensating" [19]

The Wechsler tests of adult intelligence The Wechsler scale, otherwise known as *The Bellevue Intelligence Tests*, consists of ten tests, five verbal and five non-verbal, and a vocabulary test as an alternate These have been standardized upon cases ranging in age from 10 to 16, forming the *adolescent scale,* and on cases ranging from 16 to 60, forming the *adult scale.* The tests are made up of a variable number of questions, as information test, 25 questions, comprehension test, 10 questions, similarities test, 12 questions, and so on [20] Variable credit is frequently allowed, depending upon the quality of response The raw score is a weighted point score Thus these tests, as those of Kuhlmann, incorporate both aspects of point scales

This instrument has many excellent features, the most notable

[18] *Op cit*, p 41

[19] *Ibid*, p 48

[20] D Wechsler, *The Measurement of Adult Intelligence* Baltimore Williams and Wilkins Co, 1941

of which is, perhaps, the fact that it is standardized on an adult population For example the performance of a man of fifty is assessed by comparing his score with scores earned by standardization cases of his own age This is of the greatest importance in view of the fact that the test performance of adults declines gradually from around 25 to 30 years of age onward Thus, since *M A*'s decline as indicated, the usual practice of obtaining *I Q*'s of adults by dividing earned *M A*'s by a constant *C A* value of 15 or 16, or any other such value, is indefensible By the traditional procedure the mean *I Q* of various age groups in the general population stands at 100 up to the age of 25 or 30, approximately, and thereafter declines For age groups of 70 or above it stands at about 80, rather than 100 By the Wechsler procedure the *I Q* is derived by dividing the earned score by the mean score of the standardization cases of the examinee's age In principle it is so derived, in practice it is derived from standard scores (which see) Mean *I Q*'s on the Wechsler tests, assuming perfect standardization, should be 100 at all age levels Thus, the *I Q*, for the first time, takes on the same significance at the adult levels as it has had at pre-adult levels, namely an index of brightness and nothing more

Another feature of these tests that deserves special mention is the fact that the non-verbal tests have proved to be considerably more successful, as measures of general intelligence, than most of those used heretofore The Wechsler tests have been well received and, despite their short history, are recognized as a significant contribution to intelligence testing

SOME PRINCIPLES OF TESTING

On reliability There are but few instances in psychology where the term *other things being equal* applies with so much appropriateness as here High reliability in a test is desirable if it can be achieved at not too great a sacrifice in other qualities [21] Reliability coefficients are easy to obtain, and it is ordi-

[21] In its simplest terms reliability refers to consistency A test is reliable to the extent that an examinee makes the same score on repeated administrations of the test In practice the reliability of a test may be determined by administering two equivalent forms of a test to a suitable group of examinees and correlating the scores, and by similar procedures

narily not difficult to design a test that measures up rather well in reliability At any rate the achieving of reliability is one of the least of the designer's burdens While very low reliability taken by itself is a sign of a poor test, very high reliability taken by itself signifies very little about the merit of a test In fact some authorities, both in achievement testing and intelligence testing, are inclined to be skeptical of tests of extremely high reliability, on the ground that such reliability is likely to be achieved at the expense of other desirable features

While making the admission that the importance of reliability coefficients has been over-emphasized both in achievement testing and in intelligence testing, we should not overlook some very serious consequences of failing to take any account of them at all One teacher of the writer's acquaintance was disturbed to find that one of her pupils had lost five months in reading ability between the October and December testing, as indicated by the scores earned on the reading section of an achievement battery By a little attention to reliability she could have seen that were such a test repeated the next day some pupils would "gain" and some would "lose," and that for an occasional pupil the change would be quite marked

It is also well to keep in mind that the separate tests in an achievement battery and the sub-tests in a battery of intelligence tests are considerably less reliable than the whole battery For this reason the greatest caution should be exercised in interpreting profile charts based upon sub-tests It should be appreciated that considerable variability is to be expected by chance

P E of the I Q For a large, random sampling of pupils the median variability of the group as between two examinations is normally expected to be about 5 *I Q* points, disregarding the sign, even when the tests are administered only two or three days apart In other words one half of the pupils change 5 *I Q* points or more, a few change quite markedly Perhaps the problem may be approached more profitably from the standpoint of the Probable Error or the Standard Error The *P E* of New Stanford Revision *I Q*'s has been found to approximate 3 per cent This means that the variability in high *I Q*'s is con-

sideiably gieatei than in low ones The obtained *P E* at the *I Q* level 130 and above is 3 54, this being equivalent to a reliability coefficient of 90, the obtained *P E* at the *I Q* level 90–109 is 3 04 (reliability coefficient equivalent, 92), the obtained *P E* at the *I Q* level below 70 is 1 49 (reliability coefficient equivalent, 98)

The highei the reliability of a test oi the smaller the *P E* of the *I Q*, the greatei the confidence we may place in the *I Q* When the obtained *I Q* is 132 and the *P E* is 3 54 (the *P E* of Stanfoid-Binet *I Q* above 130), we may say at the 50 pei cent level of confidence that the obtained *I Q* does not deviate fiom the tiue *I Q* by moie than 3 54 Foi the limits of the 25 per cent confidence inteival we should have to go 1 71 *P E* above and below the obtained *I Q*, for the 10 per cent inteival, 2 44 *P E*, foi the 5 per cent inteival, 2 99 *P E*, and for the 1 pei cent inteival, 3 82 *P E* Hence, if the obtained *I Q* is 132, the limits of the 1 per cent confidence interval may be found by multiplying 3 82 × 3 54 and adding this pioduct to, and subtiacting it fiom, 132 This pioceduie gives 118 48 and 145 52 as the 1 pei cent limits [22]

Methods of determining the validity of test items As an illustration of the type of pioceduie applied to the deteiming of the validity of test items, attention is called to the woik on the old Stanfoid-Binet scale [23] The ciiteiia against which the validity of the individual items was checked are as follows first, increase in pei cent of childien passing an item at the successive age levels, second, coheiency, and third, coiielation with an independent estimate of intelligence, such as teachers' iatings oi giade placement

The fiist criteiion needs but little comment, except to say that it is a necessary but not a sufficient characteristic of a valid item It is necessary in the sense that mental ability is known to increase with age It is insufficient because measures othei than those of intelligence may also show the same chaiac-

[22] *Cf* E F Lindquist, *A First Course in Statistics*, pp 106 ff Boston Houghton Mifflin Co, 1942

[23] L M Terman, *et al*, "The Stanford Revision and Extension of the Binet-Simon Scale for Measuring Intelligence," *Educational Psychology Monogiaphs*, 1917, No 18

teristic For example almost any anatomical measurement or test of strength shows an increase with age up to maturity just as do measures of intelligence

If the scale as a whole is known to have acceptable validity as shown by a satisfactory correlation with independent criteria, the third step, that of correlating each item with the criteria, may be dispensed with, and the second step made to serve therefor This was done in the case in point We shall turn, therefore, to the manner of applying the second step, coherency By this term is meant correlation of the individual items with the entire scale As the authors say, if 10-year-old children who by the test have 11-year-old intelligence do not pass an item with greater frequency than do 10-year-old children who test at 9-year-old intelligence, the item itself or the scale as a whole lacks validity For example, at age 7, for the test "naming the days of the week," 33 per cent of the standardization cases with *I Q*'s below 96 passed the item, 62 per cent of those having *I Q*'s between 96 and 105 passed it, and 85 per cent of those having *I Q*'s above 105 made successful responses

It is obvious that the validity of intelligence tests is assessed by checking them against fallible criteria, because no others are available For this reason an indispensable factor in test construction is a great deal of good common sense based upon a vast amount of experience with tests as, for example, in the tests of Binet, Kuhlmann, and Terman

In general there are four conditions that may make for low validity coefficients of a test, to wit (1) lack of reliability of the criteria, (2) lack of validity of the criteria, (3) lack of reliability of the test, and (4) lack of validity of the test School marks as a criterion are somewhat lacking in reliability Those of some teachers are more reliable than those of others, but none are perfectly reliable But were they in every case exactly representative of pupils' accomplishment they would still not be an infallible criterion of intelligence, that is to say, they also lack validity A pupil may earn a better mark than another not because he is more able but because he works harder Thus academic achievement is not a perfectly valid

criterion of intelligence, even when such achievement is accurately assessed Industry, habits of work, ambition, and other factors besides intelligence contribute to academic attainment

Validity of the I Q By validity of the *I Q* as a unit of measurement is meant the absence of systematic variations contingent upon age We know that *M A* is not by itself a satisfactory unit of measurement because its value changes with age That is, an acceleration or retardation of one year in *M A* at age 5 does not have the same significance as acceleration or retardation in like amount at age 10 Thus for an interpretation of an *M A* score it is always necessary to state the *C A*

In the sense here used the *I Q* is valid if its meaning may be generalized, if an *I Q* of a given value signifies the same degree of brightness at one age as at another This condition can prevail only if the *I Q* is constant except for chance changes or other disturbances that are not of a systematic order If as children grow older their *I Q*'s change systematically in one direction or the other, the *I Q* is not valid, according to the present usage

For complete validity there must be an absence of systematic change at all *I Q* levels As is seen presently, some writers, while accepting the validity of the *I Q* for children of average test intelligence, maintain that it lacks validity at both extremes Specifically, they insist that children having low *I Q*'s earn successively lower ones as they grow older and that the reverse tendency obtains with respect to children of high *I Q*'s Experimental data are presented presently Suffice it to say here that in terms of the data the issue is debatable That absence of systematic change is any less a fact at the high and low levels than at the middle level has, in the writer's opinion, yet to be conclusively demonstrated

It should be pointed out that the *I Q* is somewhat lacking in validity at the adult level, when determined by conventional procedure Stanford-Binet *I Q*'s decline systematically for the age ranges above 25 or 30 years As is seen previously this limitation in validity does not exist with respect to the Wechsler tests

Finally, it should be said that validity of the *I Q* in this sense implies nothing about the rate of mental growth, beyond the fact that children tend to keep their relative positions A child having an *I Q* of 80 grows 80 of a mental year, as measured, for each calendar year, but this does not imply that 80 of a mental year at 5 and at 10 are the same [24]

The speed-power issue In measurement parlance speed tests and power tests represent one system of classification Technically, a speed test is made up of items of equal difficulty, so that speed is the main variable A power test is one in which the items increase in difficulty in an ascending scale and in the answering of which the pupil is given unlimited time, so that power not speed is the limiting factor in the score An example of this kind of test is the I E R scale *C A V D* In practice, most group intelligence tests combine speed and power in that the items vary in difficulty and a strict time limit is imposed However, it is possible for such a test to be so designed that the time limit loses much of its effectiveness in the sense that the earned scores are not changed materially when unlimited time is given In fact this appears to be the case with respect to some tests

Cognizance is taken of another fact that has not been generally appreciated, namely that power is not necessarily eliminated in a test whose items are of equal difficulty It may be pretty largely eliminated in a test whose items are so easy as to place little or no premium upon intellectual ability, as in rate of tapping or color naming But if the items are sufficiently difficult to tax the intellectual ability of the subjects taking the test, power is necessarily involved even if the items are of equal difficulty, because it is power that enables a subject to react to them quickly Power upon the part of a subject makes the items easy, with the result that he proceeds quickly, lack of power makes the items difficult with the result that he proceeds slowly Thus, speed and power have a legitimate meaning in so far as they pertain to the mechanical construction of a test, but these mechanical arrangements have no necessary

[24] See M W Richardson, "The Logic of Age Scales," *Educational and Psychological Measurement*, 1941, Vol 1, pp 25–34

psychological significance Moreover, when we talk about a test whose items are of equal difficulty, it should be kept in mind that this is only an average determination It is obviously impossible to construct a test in which each item has the same degree of difficulty for each person taking the test, or for any person taking it

In the attempt to determine whether group intelligence tests are predominantly speed or power tests, correlations have been computed between the scores earned in standard testing time and those earned in two and even three times standard time Without exception the correlations obtained have been very high, almost as high as those obtained between two sets of scores earned in standard time This means that the examinees maintain their relative positions when the time allowance is doubled or trebled

The latter finding is a very important one Although it does not necessarily prove that the tests in question are primarily speed tests or primarily power tests (both claims have been made – *cf* F N Freeman, *op cit*), it does spike the shallow criticism to the effect that were longer time allowances given the end results would be radically different [25] In all probability speed and power, on power tests or on any tests of sufficient difficulty to tax the ability of the subjects, are highly correlated While the findings with respect to variable time limits do not argue conclusively that the tests are primarily speed tests or power tests, they do argue that the tests are not necessarily poor tests because of the time limits It is interesting to note that fairly high correlations have been obtained, about 85, between the Army Alpha, a timed test, and the I E R scale *C A V D*, a test of unlimited time allowances Perhaps a more crucial issue is whether scores on a timed test correlate more highly

[25] C C Brigham, *A Study of American Intelligence* Princeton Princeton University Press, 1923 G M Ruch, "The Speed Factor in Mental Measurements," *Journal of Educational Research*, 1924, Vol 9, pp 39–45 G M Ruch and W Koerth, "'Power' vs 'Speed' in Army Alpha," *Journal of Educational Psychology*, 1923, Vol 14, pp 193–208 M A Tinker, "Speed in Intelligence," *Journal of Applied Psychology*, 1934, Vol 18, pp 189–196 C M Tryon and H E Jones, "The Relationship between 'Speed' and 'Altitude,'" *Journal of Experimental Psychology*, 1933, Vol 16, pp 98–114

or less highly with the test criteria than do scores earned on a test without time limit

UNITS OF MEASUREMENT

M A and I Q *M A* scores indicate level of mental development, or of ability, the *I Q* is an index of brightness Obviously, it is possible for two pupils to have the same *M A* and differ radically in brightness Likewise an *I Q* of any given magnitude represents the same degree of brightness in pupils whatever their mental ages may be Therefore, *M A* and *I Q* are very useful complements one of the other

The *M A*, introduced by Binet, and the *I Q*, attributed variously to Stern, Terman, and Kuhlmann, have had the longest history of any of the units of measurement The New Stanford Revision retains them The new Kuhlmann tests provide *M A* norms, although other units are provided and preferred by Kuhlmann The *M A* and the *I Q* are now generally better understood by parents and teachers than are any of the other units Perhaps this fact, rather than any logic inherent in test construction, recommends their continued use

Percentile scores Percentile scores are very serviceable at a practical level They serve to rank a pupil's score with respect to the standardization cases of his age As such they constitute a measure of brightness, and indicate in a gross way the developmental level inasmuch as the reference point is the pupil's own age group But they do not express the developmental level with anything like the exactness that the *M A* does, neither do the standard scores, discussed presently

The chief limitation to percentile scores lies in the inequality of the units The difference in raw score points corresponding to percentile scores of 90 and 99 is typically much greater than the difference in the raw score points corresponding to percentile scores of 50 and 59 This is a serious limitation if the inequality is not appreciated The practice of treating percentile scores mathematically is not strictly feasible This limitation is overcome in standard scores

Standard scores Standard scores are scores derived from the standard deviation The statistician has a predilection for

these scores In a typical distribution the units are equal in the sense that the difference between 0σ and $+1\sigma$ is the same in score value as the difference between $+1\sigma$ and $+2\sigma$, or between -2σ and -3σ If, for example, a distribution yields a standard deviation of 10, the difference between any two adjacent *sigma* values is 10 score points, and the difference between any two fractional parts of one standard deviation, taken anywhere along the scale, equals a like fractional part of 10 In this example, any 5σ equals 5 score points, any 2σ equals 2 score points For these reasons standard scores yield readily to mathematical treatment

There are two well known forms of standard scores, the *T*-score (of McCall) and the *z*-score The former is a normalized *sigma* score – a procedure that corrects, as it were, for lack of normality in a distribution *Sigma* values corresponding to empirically determined percentile points are assigned by consulting a statistical table of areas of the probability surface This *T*-score takes 50 as the mean and assigns the value of 10 to each *sigma* unit The *z*-score is but another name for *sigma* scores The following will serve to illustrate the meaning of these scores

σ	-3	$-2\,5$	-2	$-1\,5$	-1	-5	0	$+5$	$+1$	$+1\,5$	$+2$	$+2\,5$	$+3$
T score	20	25	30	35	40	45	50	55	60	65	70	75	80
z score	-3	$-2\,5$	-2	$-1\,5$	-1	-5	0	$+5$	$+1$	$+1\,5$	$+2$	$+2\,5$	$+3$
Percentiles	13	1	2	7	16	31	50	69	84	93	98	99	99 87

The shape of the distribution of *z*-scores is the same as that of the original raw scores, whereas *T*-scores are normally distributed regardless of the form of the distribution of the original raw scores While it is true that standard scores provide equal units of measurement in the sense indicated above, it is extremely important to note that these units are uniform in a metrical sense only if it can be assumed that the raw score units from which they are derived are uniform – an assumption that is not generally satisfied in educational and psychological measurement

M U and P C (P A) scores The Heinis mental units and personal constant have been proposed as substitutes for the *M A* and *I Q* The *P C* (called *P A*, per cent of average, by Kuhlmann) is a proposed correction for the alleged tendency

for the *I Q*'s of dull children to decrease and for those of bright children to increase as the children grow older [26]

Herrns worked out a formula for the mental growth curve, based upon 15 tests administered to a group of normal children ranging from 6 to 12 years of age The mental growth curve is then expressed in mental units This curve so expressed is illustrated as follows age 1, 60 units, age 4, 193 units, age 8, 300 units, age 12, 358 units, age 16, 390 units It is clear that this is a negatively accelerated curve The pupil's score is translated into these mental units, that is, the *M U* equivalent is found by consulting an appropriate table of norms The *P C* is arrived at by dividing a pupil's earned *M U*'s by the *M U* norm for his age

The *P C* is alleged by its sponsors to have greater constancy than the *I Q* In particular it aims to correct for the reputed tendency for low *I Q*'s to decrease and high ones to increase with age Obviously this correction is unnecessary unless the *I Q*'s do so behave As is stated above, the issue is at present equivocal Since no clear tendency is found in the dozen or so investigations that have been reported, perhaps this equivocation may be taken as a sign that the changes do not take place, as alleged

Investigations by Kuhlmann,[27] Anderson,[28] and Hilden [29] show a tendency for low *I Q*'s to decrease as children grow older Baldwin and Stecher report an investigation in which the reverse tendency was observed with respect to bright chil-

[26] H Herris, "A Personal Constant," *Journal of Educational Psychology*, 1926, Vol 17, pp 163–186 K P Bradway and E L Hoffeditz, "The Basis for the Personal Constant," *Journal of Educational Psychology*, 1937, Vol 28, pp 501–513

[27] F Kuhlmann, "The Results of Repeated Mental Reexaminations of 639 Feebleminded over a Period of Ten Years," *Journal of Applied Psychology*, 1921, Vol 5, pp 195–224

[28] M Anderson, "A Study of the Results Gathered from Repeated Mental Examinations of 200 Defective Children Attending Special Schools over a Period of Eight Years," *Journal of Applied Psychology*, 1923, Vol 7, pp 54–64

[29] A H Hilden, "A Comparative Study of the Intelligence Quotient and Herris Personal Constant," *Journal of Applied Psychology*, 1933, Vol 17, pp 355–375

dren [80] On the other hand, investigations of Henmon and Burns,[81] A W Brown,[82] R R Brown,[83] and Lincoln [84] find no consistent tendency for low *I Q*'s to decrease Lincoln, Cattell,[85] and Nemzek [86] found no tendency for high *I Q*'s to increase with age The latter did find a tendency for the low *I Q*'s to decrease Lincoln's results which are the most extensive are presented in Table XV

TABLE XV

CHANGES IN *I Q* AS RELATED TO *I Q* LEVEL

I Q Level	Boys				Girls			
	N	Median Gain	N	Median Loss	N	Median Gain	N	Median Loss
120 and above	151	9 69	165	9 05	88	8 33	115	9 10
110–119	146	11 21	120	7 33	155	8 59	144	6 51
90–109	404	8 08	333	6 81	408	8 00	339	7 31
80– 89	124	7 69	99	4 96	89	6 95	110	6 59
Below 80	125	7 32	64	4 61	55	6 62	70	5 54

In this table N signifies number of changes, not the number of children examined

[80] B T Baldwin and L I Stecher, "Mental Growth Curve of Normal and Superior Children," *University of Iowa Studies Studies in Child Welfare*, 1922, Vol 2, No 1

[81] V A C Henmon and H M Burns, "The Constancy of Intelligence Quotients with Borderline and Problem Cases," *Journal of Educational Psychology*, 1923, Vol 14, pp 247–250

[82] A W Brown, "The Change in Intelligence Quotients in Behavior Problem Children," *Journal of Educational Psychology*, 1930, Vol 21, pp 341–350

[83] R R Brown, "The Time Interval between Test and Retest in its Relation to the Constancy of the Intelligence Quotient," *Journal of Educational Psychology*, 1933, Vol 24, pp 81–96

[84] E A Lincoln, "Stanford-Binet *I Q* Changes in the Harvard Growth Study," *Journal of Applied Psychology*, 1936, Vol 20, pp 236–242

[85] P Cattell, "The Herris Personal Constant as a Substitute for the *I Q*," *Journal of Educational Psychology*, 1933, Vol 24, pp 221–228 P Cattell, "Constant Changes in the Stanford-Binet *I Q*," Journal of Educational Psychology, 1931, Vol 22, pp 544–550

[86] C L Nemzek, "The Constancy of the *I Q*'s of Gifted Children," *Journal of Educational Psychology*, 1932, Vol 23, pp 607–610

Lincoln reports the *I Q* changes of about 1200 children who were given two or more Stanford-Binet examinations within the first seven years of the Harvard Growth Study, of which the data in Table XV are a part The average deviation in *I Q* is approximately 7 points, for all cases combined It is seen that the deviations at the higher *I Q* levels are considerably greater than at the lower levels This is in keeping with the point made earlier apropos of the relationship between the magnitude of the *I Q* and its reliability It is seen that the gains tend to be greater than the losses, particularly at the lower *I Q* levels

Thus the data of Table XV give no confirmation to the claim that high *I Q*'s tend to increase and that low *I Q*'s tend to decrease with age If this is a true picture, the Heinis *P C* is unnecessary [87] The *P C* is probably more stable than the *I Q*, *i e*, it is not subject to fluctuations from examination to examination to so great an extent as is the *I Q* This we may judge from the fact that *P C* scores do not deviate so widely from the mean as do *I Q* scores But this is not the issue The real objection to the *I Q* by the *P C* proponents is its alleged tendency to show not chance fluctuations, but systematic ones of the order indicated above

SOME COMMENTS ON THE VALUE OF INTELLIGENCE TESTS

It would seem to be unnecessary to comment upon the desirability of the teacher's having knowledge of his pupils' intelligence So, the question becomes one of the usefulness of the intelligence test for purposes of supplying this information Shrewd observers among teachers can, of course, estimate the intelligence of their pupils fairly well However, there are certain serious limitations inherent in this procedure Different teachers do not and cannot rate pupils by the same standards Moreover, a teacher who has taught only in one type of neighborhood is likely to have a different conception of good, average, and poor intelligence from that of one who has taught only in a different type of neighborhood In the era before the ad-

[87] E A Lincoln, "Stanford-Binet *I Q* Changes in the Harvard Growth Study," *Journal of Applied Psychology*, 1936, Vol 20, pp 236–242

vent of intelligence tests there were no standard terms in which to describe intelligence Terms like good, poor, excellent, and fair have no precise meaning The intelligence test has provided a standard measure and a standard language

The measure is not perfect because it is standard, but, at least, we know what the measure is A Terman or a Kuhlmann *I Q* has the same meaning in Maine as in California An *I Q* of 116 obtained by one competent examiner has the same meaning as a like *I Q* obtained by another competent examiner Obviously a rating of good by one teacher does not mean the same as a like rating made by another teacher Standard methods of measuring and expressing results have the greatest importance in all educational research in which intelligence is implicated

There are other obvious advantages in intelligence tests Sometimes a teacher needs to have an estimate of intelligence before he has had time to size up the pupil from personal judgment Moreover, the estimate provided by the test serves as a check on the teacher's own judgment It is also understood that the teacher should exercise the right of checking the estimate provided by the test by his own personal judgment The intelligence test not only furnishes a fairly good estimate of intelligence, but it also furnishes it quickly, conveniently, and economically Then there are valid reasons why teachers, supervisors, and administrative officers need to know the intellectual level of the school or the community in which it is situated, as reflected by the test performance of the pupils

Needless to say, intelligence test results are not always used wisely It is alleged, and undoubtedly with justification, that some teachers tend to neglect the interests of pupils shown by a test to be dull — as if, perhaps, they were hopeless As much may be said of a health program Indeed, anything that can be used can be misused [38]

[38] *Cf* G D Stoddard, *The Meaning of Intelligence* New York The Macmillan Co , 1943

CHAPTER X

RESULTS AND APPLICATIONS OF INTELLIGENCE TESTING

Intelligence tests have had major fields of application in research and in practice Of course, most of the research in which intelligence tests have been used as instruments has had educational application, the findings have been of practical value in education In addition to the educational use of these research findings, intelligence tests have been of immense direct, practical importance in classroom teaching and administration They are quick, convenient, economical, and dependable means of gauging the general mental ability of pupils Moreover, not the least important aspect of their usefulness lies in the fact that the results may be expressed in standard terminology, which amounts to a language of common discourse The value of the latter inheres not solely in the fact it promotes ready and accurate description, but also in the fact that it leads to more facile and accurate thinking about intelligence and the various problems related to it

The use of measuring instruments is a prime requisite of research, and, naturally, the more accurate the resulting measures are, the more precise the research is Research in learning and remembering requires a technique of measurement Just so, research in intelligence — in its conditions and the factors to which it is related — requires a technique of measurement Thus from the standpoint of psychological and educational research, the intelligence test takes its place beside the most highly refined techniques of measuring learning and remembering

APPLICATION TO THE NATURE–NURTURE ISSUE

I propose to show in this book that a man's natural abilities are derived by inheritance, under exactly the same limitations as are the form and physical features of the whole organic world Consequently, as it is easy, notwithstanding those limitations, to obtain by

careful selection a permanent breed of dogs or horses gifted with peculiar powers of running, or of doing anything else, so it would be quite practicable to produce a highly gifted race of men by judicious marriages during several consecutive generations — Galton [1]

It is difficult to imagine an issue of greater educational and sociological moment than that raised by Galton 75 years ago Later, Karl Pearson, a pupil, attempted an experimental test of Galton's dictum He secured ratings by teachers on about 2000 siblings in such traits as intelligence, vivacity, conscientiousness, popularity, temper, self-consciousness, assertiveness, and handwriting, and computed correlations between the ratings given sibling pairs The average of the coefficients for all traits between brother and brother equaled 51, between sister and sister, 52, and between brother and sister, 52 Previous investigation had yielded intersibling correlations with respect to such traits as color of eyes, color of hair, height, and length of forearm from 50 to 55 Pearson reasoned that since these correlations between mental traits of siblings are as high as those between anatomical traits — traits admittedly hereditary — the former are hereditary also, "in the same manner and with the same intensity"

Incidentally, the logic of this reasoning is somewhat wanting in soundness It is one of a number of instances in which negative results would disprove a proposition but in which positive evidence does not prove it That is, since hereditary traits admittedly run in families, the finding of an absence of intersibling correlation on a valid measure of a trait would prove that the trait is not hereditary, provided the trait in question is not susceptible to differential environmental modification But in the case of traits that are amenable to training, the presence of a correlation could be explained on the basis of common training

Pearson's study is not remembered so much for his findings as for his opening up of a field of research with respect to the basis of individual differences in mental ability His work also

[1] F Galton, *Hereditary Genius an Inquiry into its Laws and Consequences*, p 1 London Richard Clay and Sons, Ltd , 1869 New York, The Macmillan Co , 1914

emphasizes the need of valid measures as research instruments With the advent of the intelligence test there arose keen interest in the nature-nurture issue as related to intelligence

On the interdependence of nature and nurture It should be said at the outset that both nature and nurture must be looked upon as indispensable factors in intelligent behavior It is not an "either-or" proposition Without learning, which implies nurture, there could be no such thing as intelligent behavior in a degree that is significant at the human level Contrariwise, only those organisms that have the requisite biologically given structures can learn to a degree required of intelligent behavior at this level Consequently nature and nurture are both limiting factors Neither alone insures the development of intellectual ability In another light, it may be said that the biological history of each individual sets a kind of ceiling above which no amount of nurturing may take him This is in the nature of an *a priori* truth The most that may be said for nurture is that the nearness of one's approach to his ceiling is a function of his nurturing

Even so, the problem before us is still a very real one Most children of civilized countries today live in a fairly good cultural environment, fairly good in comparison with that of children in primitive societies In the normal course of development they acquire considerable mastery of a highly developed language, they receive a certain amount of training with respect to methods and norms of logical thinking In comparison with children of pre-literate societies they acquire and use a vast amount of information Perhaps there are some poorly defined minimum cultural essentials for mental development, just as there are certain minimum essentials in diet

In the matter of diet there are, theoretically, certain minimum essentials required for life and below which life cannot be sustained Perhaps increments in quantity and quality of food beyond this point would for a time produce very marked effects, with the principle of diminishing returns operating, at least beyond a certain point It is conceivable that some such principle operates with respect to intellectual development

Should it turn out that an improvement of 20 per cent in the diet of a certain segment of the population produces no measurable change in the growth and health of the children, this would in no wise argue that diet is unrelated to growth and health Thus it may be that the cultural environment of at least the great majority of children of civilized countries is somewhere near the saturation point, so that additional increments do not produce measurable increments in intelligence This condition, were it true, would argue nothing about the importance of cultural transmission and stimulation in the development of intelligence, nor would it argue that the measurable intelligence of certain minority groups would not benefit materially from improvement in cultural opportunities

From an educational point of view a very real problem is when, if at all, improvement in culture reaches the point of diminishing returns and, if found to do so, what the nature of the relationship beyond that point is, between increments in cultural stimulation and intellectual development A person reared *in vacuo* could by no consideration make a successful response to a test question, nor could the question have even the slightest meaning to him The problem can be attacked in a gross way by assessing as best we can the intelligence of children as we find them in various kinds of cultural environments and by assessing the effects of moving children to better environment

Were all children reared in like culture or were all by virtue of being reared in the best possible culture pushed to the full limit of their potentialities, heredity would of course seem all-important Were heredity constant, differences in environment might appear to be extremely important But actually cultural environment and heredity are co-variables

It does not seem appropriate here to undertake an exhaustive treatment of the extant data relating to this subject We shall rather indicate what the lines of attack have been and with what result, and shall in some instances cite specific experimental findings whenever they appear to be of value in their own right

Family resemblances (1) *Galton's investigation* Galton's celebrated study of 977 eminent men was, to the writer's knowledge, the first systematic attempt to apply to the subject of mental development the acknowledged fact that hereditary traits tend to run in families [2] Upon compiling the list of eminent men he set about to determine the number of relatives they had of like eminence and to contrast this number with the number normally expected from any 977 men selected by random sampling He found 332 close and 203 remote relatives of a degree of eminence comparable to that of the original list of eminent men, that is, who ranked as 1 in 4,000 men On the other hand, he reckoned that the normal expectancy for a random sampling of 977 men was one close relative of this degree of eminence, and three remote relatives

(2) *Degenerate families* The pioneer study of degenerate families was made by Dugdale, a study that embraced seven generations of the Jukes family [3] The investigation was brought up to date in 1915 by Estabrook [4] Data were compiled on 540 blood relatives and 169 persons related by marriage It is reckoned that the total cost of this family to the state of New York in pauperism, crime, vice, and disease was $1,500,000 within the period of 75 years

The best known of the investigations is Goddard's, of the Kallikak family [5] The history of this family dates from revolutionary war days At the time of the investigation there were 480 known descendants The findings are summarized in Goddard's words as follows "The surprise and horror of it all was that no matter where we traced them, whether in prosperous rural districts, in the city slums to which they had drifted, or in the remote mountain regions, or whether it was a question of the second or sixth generation, an appalling amount of defectiveness was everywhere found" [6]

[2] *Op cit*

[3] R L Dugdale, *The Jukes a Study of Crime, Pauperism, Disease, and Heredity* New York Putnam, 1910 (First edition, 1877)

[4] A H Estabrook, *The Jukes in 1915* New York Carnegie Institute, 1916

[5] H H Goddard, *The Kallikak Family* New York The Macmillan Co, 1912

[6] *Ibid*, p 16

(3) *Sibling resemblances in test intelligence* The figure that is commonly taken as representative of the obtained coefficients between the intelligence test scores of sibling pairs is 50 In a recent article Conrad and Jones [7] report an average coefficient of 49 between sibling scores on both the Stanford-Binet and Army Alpha tests [8]

(4) *Parent-child resemblances* Jones [9] and Willoughby [10] published independently the results of investigations of the relationship between the test intelligence of parents on the one hand and that of their children on the other Jones administered the Army Alpha to a group of parents (N = 210) and to children over 14 years of age, and the Stanford-Binet to children 3 to 14 (total N = 317) Some of the correlations obtained are as follows

	Son	Daughter	Son and Daughter
Father	52	51	51
Mother	54	56	55

Willoughby administered 11 different tests to a group of children and their parents The correlations obtained by him between the performances of children and those of their parents are somewhat lower than those obtained by Jones However, on tests that resemble somewhat those used by Jones his coefficients are more nearly comparable More recently Conrad and Jones [11] obtained a coefficient of 49 between Stanford-

[7] H S Conrad and H E Jones, "A second study of familial resemblance in intelligence environmental and genetic implications of parent-child and sibling correlations in the total sample" *Intelligence Its Nature and Nurture*, Thirty-ninth Yearbook, Part II, pp 97–141, National Society for the Study of Education Bloomington, Ill Public School Publishing Co, 1940

[8] See also G H Hildreth, "The Resemblance of Siblings in Intelligence and Achievement," *Teachers College, Columbia University, Contributions to Education*, No 186, 1925 E S Dexter, "On Family Resemblances beyond the First Degree of Relation," *School and Society*, 1924, Vol 19, pp 501–502

[9] H E Jones, "A First Study of Parent-child Resemblance in Intelligence," *Nature and Nurture Their Influence upon Intelligence*, Twenty-seventh Yearbook, Part I, pp 61–72, National Society for the Study of Education Bloomington, Ill Public School Publishing Co, 1928

[10] R R Willoughby, "Family Similarities in Mental Test Abilities," *loc cit*, pp 55–59

[11] *Op cit*

Binet scores of parents and offspring and a coefficient of like magnitude between Army Alpha scores of parents and offspring [12]

(5) *Twin resemblances* The literature contains reports of a number of investigations of the relationship between the mental abilities of twins, some of which antedate the advent of intelligence tests Among the more important of the early investigations are those of Thorndike,[13] Merriman,[14] and Wingfield and Sandiford [15] The results of an investigation conducted by Holzinger, Freeman, Newman, and Mitchell are reported in part in Table XVI [16]

A fair appraisal of the published correlations pertaining to

TABLE XVI

RESEMBLANCES BETWEEN IDENTICAL AND FRATERNAL TWINS

Measures	Identical (50 pairs)	Fraternal (52 pairs)
Finger ridges	97	46
Standing height	93	65
Binet *I Q*	88	63
Otis *I Q*	92	62
Word meaning	86	56
Nature study	77	55
History and literature	82	67
Spelling	87	73

[12] See also H M Richardson, "Studies of Mental Resemblances between Husbands and Wives and between Friends," *Psychological Bulletin,* 1939, Vol 36, pp 104–120

[13] E L Thorndike, "Measurement of Twins," *Archives of Philosophy, Psychology and Scientific Method,* 1905, No 1

[14] C Merriman, "The Intellectual Resemblance of Twins," *Psychological Monographs,* 1924, Vol 33, No 5

[15] A H Wingfield and P Sandiford, "Twins and Orphans," *Journal of Educational Psychology,* 1928, Vol 19, pp 410–423

[16] K Holzinger, "The Relative Effect of Nature-nurture Influence on Twin Differences," *Journal of Educational Psychology,* 1929, Vol 20, pp 241–248

the correspondence between the test intelligence of twin pairs is contained in the following coefficients

Comparison	Correlation
Fraternal twins	60 to 65
All twins	70 to 75
Identical twins	85 to 90

Intellectual development of isolated children One of the earliest reports bearing specifically upon the intellectual development of isolated children is that of Gordon [17] This report contains illuminating data relative to the intellectual status and development of "canal boat" and gypsy children in England The former grew up under rather severe conditions of cultural isolation, inasmuch as most of their lives was spent on boats They were in school less than 5 per cent of the school year Gordon made two observations with respect to this group which have been repeated with respect to other isolated groups, namely that the average obtained (Stanford-Binet) *I Q* was

TABLE XVII

THE *I Q*'S OF EAST TENNESSEE MOUNTAIN CHILDREN

	Median *I Q*			
C A	N	Dearborn Test	N	Illinois Test
6	33	94 7		
7	62	90 9		
8	60	88 9	23	85 4
9	94	86 4	47	86 8
10	99	84 3	90	80 3
11	102	80 0	102	78 3
12	107	81 4	113	77 9
13	109	77 6	120	77 5
14	125	74 7	125	74 8
15	61	73 4	63	71 1
16	29	73 5	31	69 4

[17] H Gordon, 'Mental and Scholastic Tests among Retarded Children" London Board of Education Pamphlet, No 44, 1923

low (69 6) and that a marked tendency prevailed for the *I Q*'s to decrease with increasing age Both of these findings were obtained in the case of the gypsy children studied

Three or four investigations have been reported on geographically (and therefore culturally) isolated children, to wit, children in the mountainous regions of the southeastern portion of the United States Wheeler's data are listed in part in Table XVII [18] For additional data the reader is referred to investigations by Hirsch [19] and Sherman and Henry [20]

The constancy of the I Q Like the other topics discussed in this section the question of the constancy of the *I Q* is of educational importance in its own right, quite aside from its bearing upon the nature-nurture issue In various samplings of school populations the average change in *I Q*, as between two or more examinations given 1 to 7 years apart has been found to be from about 5 to about 7 *I Q* points This, as the reader will recall from the discussion in the previous chapter, approaches the reliability of the tests The average change between two sets of *I Q*'s derived no more than a week apart on a group of subjects amounts to about 4 points Thus an average deviation of from 5 to 7 points over a period of several years is indicative of very little change beyond that incident to the unreliability of the tests

In the Harvard Growth Study two or more intelligence tests were administered to about 1200 children within a 7-year period [21] The median change was found to be 7 35 points for boys and 7 17 points for girls [22]

Account should be taken especially of the fact that no such constancy as that indicated above is found for the *I Q*'s, or other

[18] L R Wheeler, "The Intelligence of East Tennessee Mountain Children," *Journal of Educational Psychology*, 1932, Vol 23, pp 351–370

[19] N D M Hirsch, 'An Experimental Study of the East Kentucky Mountaineers," *Genetic Psychology Monographs*, 1928, Vol 3, No 3

[20] M Sherman and T R Henry, *Hollow Folk* New York Thomas Y Crowell Co , 1933

[21] E A Lincoln, "Stanford-Binet *I Q* Changes in the Harvard Growth Study," *Journal of Applied Psychology*, 1936, Vol 20, pp 236–242

[22] See also A W Brown, "The Change in Intelligence Quotients in Behavior Problem Children," *Journal of Educational Psychology*, 1930, Vol 21, pp 341–350

forms of test scores, of young children, particularly children under 3 years of age Instead of the usual coefficient of about 9 between two sets of *I Q*'s derived one or more years apart, in the case of children of school age, coefficients in the neighborhood of 3 or 4 are typical for children of preschool age This does not necessarily signify greater inconstancy of mental growth for this level Conceivably it may be a function of the nature of the tests used [23]

Nursery school training Articles on the effect upon intelligence test performance of tenure in a nursery school have been appearing in the literature for 10 or 15 years Some are to be found in the Twenty-seventh Yearbook [24] of the National Society for the Study of Education, and in the Thirty-ninth Yearbook [25] of the same society 11 articles are devoted to the subject [26] Of the latter group the research reported in 7 of the articles failed to indicate a significant increase in *I Q* during nursery school tenure, 4 gave evidence of such a change

Foster home placement Investigations of the effect of foster home placement upon intelligence test performance parallel in history and in rationale those of nursery school training The Twenty-seventh Yearbook of the National Society for the Study of Education featured two ambitiously conceived investigations of this topic, those of Freeman, Holzinger, and

[23] M K Honzik, "The Constancy of Mental Test Performance during the Preschool Period," *Journal of Genetic Psychology*, 1938, Vol 52, pp 285–302 V L Nelson and T W Richards, "Studies in Mental Development I Performance on Gesell Items at Six Months and Its Predictive Value for Performance on Mental Tests at Two and Three Years," *Journal of Genetic Psychology*, 1938, Vol 52, pp 303–325 V L Nelson and T W Richards, "Studies in Mental Development III Performance of Twelve-months-old Children on the Gesell Schedule, and Its Predictive Value for Mental Status at Two and Three Years," *Journal of Genetic Psychology*, 1939, Vol 54, pp 181–191

[24] *Nature and Nurture Their Influence upon Intelligence*, Twenty-seventh Yearbook, Part I, National Society for the Study of Education Bloomington, Ill Public School Publishing Co , 1928

[25] *Intelligence Its Nature and Nurture*, Thirty-ninth Yearbook, Part II, National Socity for the Study of Education Bloomington, Ill Public School Publishing Co , 1940

[26] See also H M Skeels, R Updegraff, B L Wellman, and H M Williams, "A Study of Environmental Stimulation," *University of Iowa Studies Studies in Child Welfare*, 1938, Vol 15, No 4

Mitchell [27] and of Burks [28] The former found substantial, the latter, less substantial, evidence that residence in foster homes leads to an increase in *I Q* Ordinarily foster home placement effects some improvement in home conditions Freeman *et al* found that the better the foster home, the younger the age of the children at the time of placement, and the longer the period of residence, the greater was the increase in *I Q*

The procedure employed by Skeels and Skodak in their investigation of the effect of foster home placement is the most promising of any yet applied to the problem About 150 infants (under 6 months of age) of illegitimate parentage were placed in economically favored homes The occupations of 80 per cent of the true fathers were known Of these 81 per cent were employed in the lowest three occupational groups (on a 7-group scale) Intelligence tests were administered to about one-half of the true mothers They were found to test low The average school grade attainment of the true mothers was 9 7, that of the alleged true fathers, 10 5 Obviously the results would be more definitive had complete data been obtainable on all of the true fathers and mothers But it is reasonable to suppose that the true parents as a group were below average in test intelligence and socio-economic status, as is the rule in such cases, and that had the children been reared by their true parents they would have turned out to have *I Q*'s of a magnitude typical of such parents in the general population, that is, below average

Periodic mental examinations were made from time to time of these adopted children On the whole, their level of performance on the intelligence tests resembled that expected of own children of parents of favored socio-economic status [29]

[27] F N Freeman, K Holzinger, and B Mitchell, "The Influence of Environment on the Intelligence, School Achievement, and Conduct of Foster Children," *Nature and Nurture Their Influence upon Intelligence,* Part I, pp 103–217 *Loc cit*

[28] B S Burks, "The Relative Influence of Nature and Nurture upon Mental Development, A Comparative Study of Foster Parent-Foster Child Resemblance and True Parent-True Child Resemblance," *Nature and Nurture Their Influence upon Intelligence,* Part I, pp 219–316 *Loc cit*

[29] H M Skeels, "Mental Development of Children in Foster Homes," *Journal of Consulting Psychology,* 1938, Vol 2, pp 33–43 H M Skeels,

Summary As stated at the outset, the facts that are made to carry the burden of the nature-nurture argument are significant in their own right Were such not the case it would be difficult to justify the devoting of several pages to their presentation, for the meaning (with respect to the issue involved) of most of them is equivocal The finding that genius and degeneracy tend to run in families, that a correlation exists between the *I Q*'s of sibling and twin pairs, or that the *I Q*, except for errors of measurement, remains remarkably constant from year to year are conditions that should prevail were heredity the dominant determining factor But it is equally true that every one of these conditions is exactly as should be expected were nurture the dominant determining factor, with the probable exception of the data on identical twins It is not clear why in terms of environment there should be so much greater similarity between the test scores of identical twins than between those of fraternal twins Even here there is room for equivocation Carter in his summary of ten years of research on twins concludes "The whole array of twin-studies seems to suggest the futility and artificiality of the idea of untangling nature and nurture influences in the sense of ascertaining the percentage contributions of each in any *general* sense" [30]

The investigations involving nursery school training and foster home placement appear to present greater possibilities It is not to be supposed that foster homes are superior to own homes or that nursery schools have any inherent *I Q*-raising properties The mere fact that children do not always improve in test performance subsequent to placement in a nursery school or a foster home in itself argues nothing about the role of culture in such performance Improvement is to be expected, if at all, only if such placement represents a distinct cultural im-

"Some Iowa Studies of the Mental Growth of Children in Relation to Differentials of the Environment A Summary" *Intelligence Its Nature and Nurture,* Part II, pp 281–308 *Loc cit* M Skodak, "The Mental Development of Adopted Children whose True Mothers are Feebleminded," *Child Development,* 1938, Vol 9, pp 303–308 M Skodak, "Children in Foster Homes A Study of Mental Development," *University of Iowa Studies Studies in Child Welfare,* 1939, Vol 16, No 1

[30] H D Carter; "Ten Years of Research on Twins," *Intelligence Its Nature and Nurture,* Part I, pp 235–255 *Loc cit*

provement The cultural background of each child prior to placement should be known and the character of the environment to which the children are subsequently introduced should be known The work of Reymert and Hinton serves as a good illustration of this type of procedure [31]

If it is shown that children drawn from an inferior background do not, when placed in good foster homes and nursery schools, and at an early age, make significant gains in *I Q*, this finding would constitute strong evidence that within the environmental range actually operative the *I Q* is unaffected by culture On the whole, the investigations, particularly those involving nursery schools, are limited in value because the contrasts between the nursery school environment and the home environment have not been carefully drawn There is a further limitation in procedure owing to the fact that the test scores of very young children are not very reliable The method of placing infants in good adoptive homes — infants whose true parents are definitely known to be of low cultural status — is the most promising yet employed

The nature-nurture issue is still debatable Neither extreme position is tenable Only the relative influence of heredity and environment is debatable The nativists appear to have retreated a bit from the positions they held fifteen or twenty years ago They have not yet lost the battle They may never do so, although quite possibly they may have to relinquish still more of their holdings to make a place of greater importance for the environmentalists

DISTRIBUTION OF TEST INTELLIGENCE

Without important exceptions test scores have been found to distribute normally, that is, the percentage of children exhibiting a given degree of brightness equals, approximately, the percentage exhibiting a complementary degree of dullness The number of 8-year-old children earning an *M A* score of 9 equals, approximately, the number earning an *M A* score of 7

[31] M L Reymert and R T Hinton, "The Effect of a Change to a Relatively Superior Environment upon the *I Q*'s of One Hundred Children," *Intelligence Its Nature and Nurture*, Part II, pp 255–268 *Loc cit*

The same may be said of the number earning *M A* scores of 10 and 6, 11 and 5, and so on This relationship also holds for the other (chronological) age levels If these relationships held exactly for all age levels, the distributions of *I Q*'s of all age levels would be superposable and would plot in a normal curve For the ages 5 to 14, the Stanford-Binet *I Q*'s of the standardization cases compared with the theoretical values (derived from the obtained *S D*) at the various *I Q*-levels as follows [32]

	IQ Range								
	56–65	66–75	76–85	86–95	96–105	106–115	116–125	126–135	136–145
Obtained	33	2 3	8 6	20 1	39 9	23 1	9 0	2 3	55
Theoretical	40	3 1	11 0	22 0	27 0	22 0	11 0	3 1	40

It does not necessarily follow that intelligence is distributed normally in the general population If the standardization cases are typical of the general population, it does follow that *I Q*'s earned on existing intelligence tests distribute normally, or approximately so

It would be possible to make tests that would yield a normal distribution of scores even though intelligence is not distributed normally, and it would be possible to make tests that would not yield such a distribution even though intelligence is distributed normally Thus the question arises as to whether the test designers have consciously or inadvertently so manipulated the scores In so far as the procedures are described a negative answer is indicated Terman found that when the test items for a given age were so located that the average *M A* equalled the average *C A* it turned out that the *I Q*'s for that age level distributed normally, approximately This appears to have been the procedure adopted by other designers of mental age scales

It would be possible, of course, so to select the standardization cases as to give a distribution quite at variance with the general population We may judge that this was not done because scores in the general population are found to distribute approximately as those of the standardization cases As an ex-

[32] L M Terman, *et al*, "The Stanford Revision and Extension of the Binet-Simon Scale for Measuring Intelligence," *Educational Psychology Monographs*, 1917, No 18, p 42

ample the reader is referred to MacMeeken's survey of the test intelligence, Stanford-Binet, of Scottish children [33]

The standard deviation of the I Q The finding that the *S D* of the *I Q* is fairly constant from age level to age level — a fact that is also inferable from the validity of the *I Q* (which see) — is a very valuable one Knowledge of the *S D* of the *I Q* makes possible an accurate appraisal of the various *I Q*

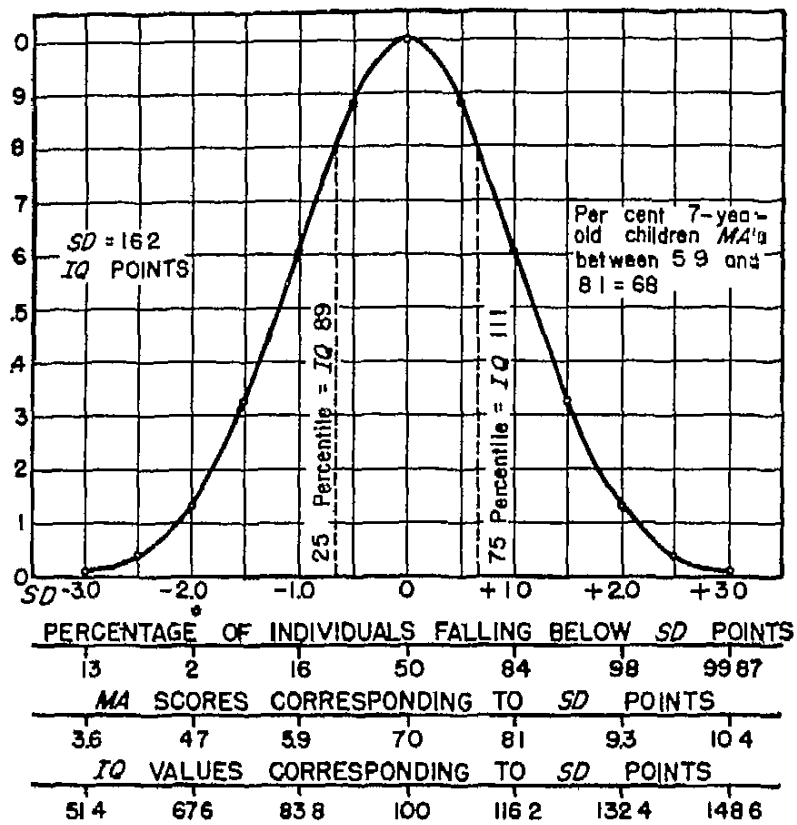


FIG 4 DISTRIBUTION OF INTELLIGENCE TEST SCORE OF 7-YEAR-OLD CHILDREN, SHOWING DISTRIBUTION OF *M A*'S AND *I Q*'S BY PERCENTAGE

magnitudes Obviously the only way to assign value to a given *I Q* score is in terms of the percentage of persons in the population who do that well or better

The *S D*'s of the Stanford-Binet *I Q*'s for the various age groups (New Revision) center rather closely around the mean, which is approximately 16 points Thus any *I Q* value can be translated readily into a *sigma* score, and that in turn into a percentile score of rather exact definition For example, an *I Q*

[33] A M MacMeeken, *The Intelligence of a Representative Group of Scottish Children* London University of London Press, 1939

score of 120 has a sigma value of +1 25, which corresponds to a percentile rank of 89 Thus 11 per cent of the population equals or exceeds an *I Q* of 120, by this test Figure 4 shows the distribution of *I Q* and *M A* scores and corresponding per cents for various *sigma* points, for *C A* 7 The obtained *S D* for this age group is 16 2 *I Q* points [34]

In this distribution the *I Q* limits between which 50 per cent of the cases lie are approximately 89 and 111 Since it is known that the *S D* of this age group is typical of that of the other age groups, and since there is reason to believe that the standardization cases are typical of the general population, we are justified in generalizing on the basis of these data

Feeblemindedness and dullness Feeblemindedness is a legal term as well as a psychological one It also has economic connotations In practice it has been found that an *I Q* level of from 60 to 70 represents the minimum intelligence required for even a partial degree of economic self-sufficiency The majority of persons between 60 and 70 *I Q* points require some amount of assistance in managing their affairs and earning a livelihood Most persons below 50 are wholly dependent There are of course other factors, such as emotional stability, character, and the like that enter the picture

For these and other reasons it is difficult to determine the exact percentage of the population that should be classed as feebleminded Even if one were to set up an arbitrary *I Q* limit, the percentage could not be readily determined, except by a general survey, because there is reason to suspect that the percentage of persons of very low intelligence is somewhat greater than the theoretical prediction [35] Since only the least

[34] J B Stroud, in *Psychology in Use,* p 288 New York American Book Co, 1941 (J S Gray, Editor) Reproduced by courtesy of the publishers

[35] It has been estimated that the percentage of cases having *I Q*'s below 45 is approximately fifteen times that expected in terms of the normal probability curve (Normal expectancy $I\ Q\ 45 = -3\ 43\sigma = 02\%$) See J A F Roberts, R M Norman, and R Griffiths, 'Studies on a Child Population IV The Form of the Lower End of the Frequency Distribution of Stanford-Binet Intelligence Quotients and the Fall of Low Intelligence Quotients with Advancing Age," *Annals of Eugenics,* 1938, Vol 8, pp 319–336

defective of the feebleminded are to be found in school, where most of the intelligence tests are administered, the percentage is difficult to determine empirically It is seen from Figure 4 that 2 per cent of the population have *I Q*'s not to exceed 67 6, according to the theoretical prediction

Concerning the dull we can be more positive Dull children are generally in school Here it is known that the empirical data agree with the theoretical prediction Thus, taking 16 as the *S D*, we find that approximately 25 per cent of school children have *I Q*'s not to exceed 90, 11 per cent, not to exceed 80, and 3 per cent not to exceed 70

FACTORS ASSOCIATED WITH TEST INTELLIGENCE

Physiological The search for physiological and anatomical correlates of intelligence has been long and for the most part uneventful As is seen in the preceding chapter Binet and his colleagues devoted considerable energy to the quest between the years 1894 and 1904 No physiological tests were found which would correlate significantly with independent criteria of intelligence The situation has not changed a great deal between then and now One possibly important exception is basal metabolic rate In two investigations Hinton has obtained evidence of a high degree of relationship between basal metabolic rate and test intelligence, the coefficients being approximately 7 [36] Others have obtained coefficients of the magnitude of from 20 to 30 between these two variables [37] The reasons for these wide discrepancies are yet to be worked out One possible reason which suggests itself is a difference in age of the subjects It is not clear from the reports that such differences were present But Hinton found a tendency for the correlations to decrease with age from 10 years onward to adult-

[36] R T Hinton, Jr, "The Rôle of the Basal Metabolic Rate in the Intelligence of Ninety Grade School Students," *Journal of Educational Psychology*, 1936, Vol 27, pp 546–550 R T Hinton, Jr, "A Further Study of the Rôle of the Basal Metabolic Rate in the Intelligence of Children," *Journal of Educational Psychology*, 1939, Vol 30, pp 309–314

[37] N W Shock, "The Effect of Benzedrine and Thyroid and Pituitary Substances on Mental Life," *Intelligence Its Nature and Nurture*, Part II, pp 139–141 *Loc cit*

hood He also states that for adults there is no correlation between the two variables

Within recent years articles have appeared in the journals describing research on the relationship between test intelligence and such factors as diabetes, allergic condition, rickets, prematurity of birth, electro-encephalograms, nutrition, and the effects of various drugs and of brain extirpation [38] On the whole, the results are negative Poull reports finding a significant gain in *I Q* — an average of 10 points — pursuant to an improvement in nutritional condition, the effect showing up after from 18 to 24 months of improved status [39] Previous investigators had found little or no evidence of improvement in *I Q* as a consequence of improved nutritional status [40]

The question of sex differences in intelligence has received extensive treatment from the inception of intelligence testing Early and inconclusive investigations gave no evidence of major differences Kuznets and McNemar who recently made a critical review of the literature on this subject were led to conclude that the earlier findings have been substantiated [41]

Deaf and hard of hearing children The appraisement of the intelligence of deaf pupils and those so hard of hearing as to put them under a severe handicap in learning a language has proved to be a troublesome and stubborn problem On the whole, performance tests or non-verbal tests have not proved to be very satisfactory tests of intelligence That is to say, scores earned on such tests correlate somewhat indifferently with the usual criteria of intelligence, even when used on normal hearing pupils [42] There is reason to believe that in some

[38] For a review of this work see J B Stroud, "Applications of Intelligence Tests," *Review of Educational Research*, 1941, Vol 11, pp 25–41

[39] L E Poull, "The Effect of Improvement in Nutrition on the Mental Capacity of Young Children," *Child Development*, 1938, Vol 9, pp 123–126

[40] See D G Paterson, *Physique and Intellect* New York The Century Co , 1930

[41] G M Kuznets and O McNemar, "Sex Differences in Intelligence-test Scores," *Intelligence Its Nature and Nurture*, Part I, pp 211–220 *Loc cit*

[42] R Pintner, "Results Obtained with the Non-language Group Test," *Journal of Educational Psychology*, 1924, Vol 15, pp 473–483 A W Brown, "The Correlations of Non-language Tests with Each Other, with

respects they are even less satisfactory for deaf children — less satisfactory in the sense that they are more likely to give an erroneous picture for deaf than for normal hearing pupils Even though a deaf pupil makes a normal score on a performance test we know at once that he is tremendously handicapped in all mental processes involving language

As is stated in Chapter III, cultural transmission is the *sine qua non* of mental development, whether racially or individually considered In a very real sense a deaf child suffers cultural isolation He is particularly limited in thought activity Let us recall from Chapter III Judd's discussion of this point, a portion of which is reproduced here "The history of thought has been, in large measure, the history of the development of certain social ideas which could be marked with definite names and made subject of thought, because they were so marked Consider for a moment the difficulty which would be experienced in conducting any train of thought with regard to the forces of physical nature if there were no names for the different forces and no fully developed definitions to give each name clearly recognized character If it is true in a general way that general tendencies of thought have been dependent upon the development of words to express ideas, it is still more true in the case of the individual that his mental tendencies are very largely determined by forms of social thought expressed in words" It is obvious that deaf children are heir to the difficulties and limitations suggested in the foregoing [43]

To this purpose Bridgman writes "So far, we have not found one deaf child who, having failed badly on a scale of non-verbal tests, was able to make even fair progress in school work On the other hand, there was a considerable proportion of deaf children in the group tested, who showed normal and at times very superior ability on non-verbal scales, but whose success in school subjects was no better than that of frankly mentally

School Achievement, and with Teachers' Judgments of the Intelligence of Children in a School for the Deaf," *Journal of Applied Psychology*, 1930, Vol 14, pp 371–375

[43] See N Keys and L Boulware, "Language Acquisition by Deaf Children as Related to Hearing Loss and Age of Onset," *Journal of Educational Psychology*, 1938, Vol 29, pp 401–412

deficient children "[44] There is a suggestion in Bridgman's findings that low performance of deaf children on non-verbal tests is diagnostic while average and superior performance is not, or is so to a lesser degree She points out, however, that most deaf children have other complications, particularly behavior difficulties The latter might explain why many normal scoring deaf children did not get on well in school It seems probable that for deaf children of school age achievement test scores afford the most satisfactory indices of scholastic aptitude

For a group of 2423 deaf children, ages 12 to 15 years, drawn from various schools for the deaf distributed over the United States, Pintner obtained an average performance test *I Q* of 83[45] The average *M A* was approximately 10 9 The average *E A* was approximately 2 years below the average *M A*, showing rather serious retardation on non-verbal intelligence tests and very serious retardation in educational achievement[46]

There is no particular reason why hard of hearing pupils should be retarded in intellectual development if they are not sufficiently defective in hearing to handicap them in learning a language or otherwise to cause them to be culturally isolated, unless the cause of the auditory defect also caused other involvements of an organic nature, particularly to the brain Pintner and Lev have compared the test performance of hard of hearing children with that of the very hard of hearing The mean verbal test *I Q* of the former was found to be 95, of the latter 92 (N = 1404) A sampling of 1556 normal hearing children achieved a mean *I Q* score of 101 on the same test On non-verbal intelligence tests the three groups scored quite comparably[47]

[44] O Bridgman, "The Estimation of Mental Ability in Deaf Children," *American Annals of the Deaf*, 1939, Vol 84, pp 337–349

[45] R Pintner, "A Mental Survey of the Deaf," *Journal of Educational Psychology*, 1928, Vol 19, pp 145–151

[46] See also A Zeckel and J J van der Kolk, "A Comparative Intelligence Test of Groups of Children Born Deaf and of Good Hearing, by Means of the Porteus Test," *American Annals of the Deaf*, 1939, Vol 84, pp 114–123 N N Springer, "A Comparative Study of the Intelligence of a Group of Deaf and Hearing Children," *American Annals of the Deaf*, 1938, Vol 83, pp 138–152

[47] R Pintner and J Lev, "The Intelligence of the Hard of Hearing School Child," *Journal of Genetic Psychology*, 1939, Vol 55, pp 31–48

Socio-racial factors Concerning the low average test intelligence of the American Negro there is no question Whether or not this characteristic is racial in the ethnological meaning of the term is another matter Some characteristics of races are cultural in origin, others, the ethnological ones, are transmissible by descent and are therefore independent of culture, as, for example, color and morphology

Garth, an authority in race psychology, writing in 1937 states that as of that date intelligence tests had been administered to 26891 Negroes, 7000 Indians, and 5000 immigrant Mexicans By a conservative estimate of published data it may be stated that the average *I Q* of Negro children does not exceed 85 That of Northern Negroes is somewhat higher, Garth's estimate is 89, that of Southern Negroes, somewhat lower, Garth's estimate, 75 Immigrant Mexicans rank below the Negroes by 6 or 8 *I Q* points, and the American Indian, just below the Mexicans [48] Rohrer in a recent investigation of a group of Indian school children in the Osage Nation found little difference between the Indian scores and white norms, a fact which, in comparison with the usual finding, might be attributed to the relatively high socio-economic status of this group [49]

Inasmuch as there is general agreement as to the facts, citations to the original research are not here made, with the exception of one recent article by Beckman [50] on the Negro and one by Hu on the Chinese [51] Considerable attention has been paid to the finding that Negro pupils compare favorably with white pupils of comparable socio-economic background Concerning the facts in the case the writer does not take issue for purposes of this discussion, although the investigations are not

[48] T R Garth, *Educational Psychology,* pp 261–262 New York Prentice-Hall, 1937

[49] J H Rohrer, "The Test Intelligence of Osage Indians," *Journal of Social Psychology,* 1942, Vol 16, pp 99–105

[50] A S Beckman, "The Intelligence of a Negro High School Population in a Northern City," *Journal of Genetic Psychology,* 1939, Vol 54, pp 327–336

[51] P C Hu, "A Study of the Intelligence of Anglo-Chinese Children," *Eugenics Review,* 1938, Vol 30, pp 109–116

sufficiently numerous or extensive to establish them beyond cavil But little can be said of this finding except that it is an interesting one It does not prove, nor seriously argue, that white and Negro children would score comparably were both on an equal cultural footing They might well do so, but this finding that matched groups make comparable scores does not argue that they would

One writer has recently maintained that inasmuch as white and Negro groups under comparison have not generally been equated in socio-economic background the comparisons are invalid The procedure suggested would yield a comparison between a certain upper per cent of Negro children and a certain lower per cent of the white children, but would not touch the real problem of how random samplings of Negro children compare with random samplings of white children Moreover, the frank admission that the children of the two races, or the children of all races, would earn the same average test scores, and that their scores would distribute the same way, were all on a comparable cultural footing, would not resolve the present differences However, could such an eventuality be established it would be a fact of tremendous sociological and psychological importance

It is to be understood that, although the average test performance of Negro children is low, there are many bright children among them Perhaps 15 or 20 per cent of the Negro children equal or exceed the median score for white children, that is, earn *I Q*'s of 100 or above In a sampling of 8000 Negro children Jenkins found that 1 23 per cent earned Stanford-Binet *I Q*'s of 120 or above This compares with approximately 10 per cent for white children Assuming the mean score of Negro children to be 85 and the *S D* to be about the same as for white children, namely 16 *I Q* points, his finding, 1 23 per cent, is rather close to the theoretical prediction [52] The meaning of the

[52] M D Jenkins, "The Intelligence of Negro Children," *Educational Method*, 1939, Vol 19, pp 106–112, M D Jenkins, "Racial Differences and Intelligence," *American Teacher*, 1940, Vol 24, pp 12–13, and O Klineberg, *Negro Intelligence and Selective Migration* New York Columbia University Press, 1935

intelligence test scores of Negro children is discussed in connection with the following topic

Socio-economic status The question of the relationship between test intelligence and socio-economic status has engaged the attention of psychologists and educators from the inception of intelligence testing The fact of a positive correlation between these two variables has long since been agreed upon Various indices of socio-economic status have been used, such as fathers' occupation, schooling of parents, rent or some equivalent, and conveniences and appliances in the home, physical condition of the house or apartment, living room furniture, and so on There is a significant and on the whole a fairly high intercorrelation between these indices

In connection with a survey of the experimentation on this subject, Loevinger concludes that $r = .4$ may be taken to represent the correlation between the test intelligence of children (ages 3 to 18) and the occupations of their fathers Honzik has found the relationship between test intelligence and socio-economic indices for children under 3 years to be negligible At the three-and-one-half-year level a mean coefficient of .25 was obtained The magnitude of the coefficient increased somewhat for successive yearly examinations up to the age of 7, where it stood at about .4 Loevinger estimates that the children of the professional and executive class exceed those of the day laboring class by one and one-half *sigma*, the former distributing about a mean corresponding to $+1\sigma$, the latter, to -5σ [53] On the new Stanford-Binet these values correspond to *I Q*'s of 116 and 92 respectively [54]

These are the facts But facts are of material value only if

[53] J Loevinger, "Intelligence as Related to Socio-economic Factors," *Intelligence Its Nature and Nurture*, Part I, pp 159–210 *Loc cit*

[54] *Cf* M K Honzik, "Age Changes in the Relationship Between Certain Environmental Variables and Children's Intelligence," *Intelligence Its Nature and Nurture*, Part II, pp 185–205 *Loc cit* N Bayley and H E Jones, "Environmental Correlates of Mental and Motor Development A Cumulative Study from Infancy to Six Years," *Child Development*, 1937, Vol 8, pp 329–341 C W Mann, "Mental Measurements in Primitive Communities," *Psychological Bulletin*, 1940, Vol 37, pp 366–395 W S Neff, "Socio-economic Status and Intelligence A Critical Survey," *Psychological Bulletin*, 1938, Vol 35, pp 727–757

we may generalize or theorize about them No great educational significance may be attached to the obtained relationship between socio-economic status and test intelligence unless the prevailingly low scores earned by unfavored children and the prevailingly high scores earned by favored children signify something other than defectiveness of the tests No thought is here entertained that these results signify anything about the innate intellectual capacities of these groups There remains the vital problem of whether or not the obtained *I Q*'s are valid for purposes of predicting academic achievement

There is a point of view adopted by many, and ostensibly a reasonable one, to the effect that the prevailing intelligence tests, involving as they do test elements that require for their answering up-bringing in a normal cultural environment, discriminate against those of poor cultural background and give an undue advantage to those of good background Commensurate with the same point of view is the thought that culturally unfavored people — primitive tribesmen, preliterates, mountaineers, sharecroppers, Negroes, and the like — are as successful in making adaptations to their environment as more favored groups are to theirs Thus, they reason, since intelligence by definition is the ability to make environmental adaptations these unfavored groups must be adjudged to be as intelligent as other groups Since it is easy to understand how intelligence tests could make an unfair discrimination it is concluded that the test results are without real meaning and that one group is as intelligent as another

No thinking person would argue that because a Hottentot or a Bushman makes a low score or even fails to score on a Stanford-Binet test he is to be judged to have low intelligence or none at all No thinking person would administer such a test under such circumstances in the first place

The trouble seems to start from the reasoning that a comparison between backward and primitive peoples and highly civilized people can be made by constructing tests out of the elements of the environment of each It appears unlikely that any valid comparison can be made at present on any basis If a Bushman earned an *I Q* of 100 on a test constructed for and

standardized on a Bushman population it would not follow that his *I Q* of 100 could in any way be compared with an *I Q* of an American child who earned a like *I Q* on an American test

But the reasoning that backward and primitive people have as much intelligence as civilized people "because they are as successful in making adaptations to their environment as civilized people are to theirs" appears to be so widespread among students that the matter deserves careful consideration. In the first place, they are *not* so successful If they were, they would not be backward or primitive There are various evidences of success in adaptation to environment One is the number of people that can sustain themselves in a given area Another is the understanding achieved of the forces of the environment and the ability to control them The use of drugs and the tools of surgery for the prevention of disease and the care of the sick is another It goes without saying that the savage could make better adaptation to his environment were he in possession of the knowledge and skill of civilized man, and so could a rat or a robin The savage makes a pretty fair axe of stone and has attained considerable mastery in fishing, hunting, and in tanning the skins of animals Perhaps, in these arts he might put to shame a man of Western culture Even so, the latter has a better way of procuring a vastly superior edge-tool if he wishes one, and a much more dependable way of procuring food and clothing, and those of superior quality

Intelligence is gauged by the number and variety of things to which an organism can adapt and by the degree to which intelligence is implicated in the adaptation There are varying levels of adaptation Successful adaptation at one level does not imply the ability to make successful adaptation at another level Ability to adapt successfully to the simpler objects of the temporal and spatial environment does not imply the ability to do abstract thinking, for example

In our own civilization there are various cultural and economic levels As seen above, test intelligence of children is associated with the quality of the cultural and economic background from which they came If it is to be assumed that these test results are artifacts and result from deficiencies in the tests,

and therefore have no predictive significance, one condition in particular must be satisfied, namely that academic achievement be virtually unrelated to socio-economic status For example, if the 15 point deficit in *I Q* levied against Negro children comes about from defects in the existing tests and is not genuine, we should have to add 15 points to the *I Q*'s of Negro children In which case a Negro pupil with an earned *I Q* of 85 should, by independent criteria, be equal to a white child with an earned *I Q* of 100 On the other hand we should have to subtract a like amount from the *I Q* of a pupil from a professional family Thus a child from a highly favored home with an earned *I Q* of 116 should by independent criteria be equal to a pupil from an average home having an earned *I Q* of 100

One independent criterion is success in school Does it turn out that pupils from unfavored homes get on in school — in terms of marks, failure, promotion, grade-placement, achievement test scores, reading ability, number ability, etc — like children from average homes and favored homes? Or do they get on like those of the pupils from good and superior homes who have earned *I Q*'s comparable to their own? And, do pupils from superior homes attain a level of success commensurate with their earned *I Q*'s, or a level commensurate with that of average children?

The data apropos of the relationship between socio-economic status and academic achievement are presented in a later chapter The writer in a recent article has summarized the experimental evidence and presented some additional data [55] Suffice it to say here that the correlation between academic success (marks) and socio-economic status is about as high as that obtained between the latter and test intelligence Significant correlations have been obtained between academic achievement and socio-economic status, with test intelligence partialed out It is clear that pupils from unfavored homes with a given earned *I Q* do not do better work in school than do average pupils of the same earned *I Q* In fact they do not do quite so

[55] J B Stroud, "Predictive Value of Obtained Intelligence Quotients of Groups Favored and Unfavored in Socio-economic Status," *Elementary School Journal*, 1942, Vol 43, pp 97–104

well Conversely, highly favored pupils with a given earned *I Q* do not do poorer work in school than socially average and unfavored pupils of the same earned *I Q*, they tend to do somewhat better

Thus it appears that the obtained relationship between test intelligence and socio-economic status is not without real educational significance We may make about the same prediction, at least no better, about a pupil from an unfavored home as about one from an average or favored home provided they have the same earned *I Q* The obtained relationship between test intelligence and socio-economic status does not appear to be due to the fault of the intelligence tests

Size of family The question of the relationship between test intelligence of children and the number of children in the family is continuous with the foregoing Cattell estimates that an inverse relationship has existed between fertility and social status since 1890, at least, in America and 1870 in Britain [56] Penrose finds that 4 children, on the average, are born to families of the unskilled labor group and 2, on the average, to families of the professional group [57] In the various published investigations which the writer has seen, negative correlations ranging from — 19 to — 34 have been obtained between test intelligence of children and the number of children in completed families The relationship is considerably reduced, but not entirely eliminated, when families are equated for socio-economic status, as Sutherland has shown [58]

TEST INTELLIGENCE AND SCHOLASTIC ACHIEVEMENT

When scores on achievement batteries are taken as tokens of academic success, coefficients of the magnitude of 8 are ordinarily obtained between intelligence test scores and academic

[56] R B Cattell, "Effects of Human Fertility upon the Distribution of Intelligence and Culture," *Intelligence Its Nature and Nurture*, Part I, pp 221–233 *Loc cit*

[57] L S Penrose, "Intelligence and Birth Rate," *Occupational Psychology*, 1939, Vol 13, pp 110–125

[58] H E G Sutherland, "The Relationship between *I Q* and Size of Family," *Journal of Educational Psychology*, 1929, Vol 20, pp 81–90

achievement Correlations between school marks and intelligence test scores are considerably lower, the modal coefficient being between 4 and 5 There are two or three reasons for this discrepancy Marks are considerably less reliable than the scores earned on achievement batteries There is considerable variability in marks from semester to semester and from subject to subject in the same semester — a condition that is included, in part, in the meaning of reliability Intercorrelations between marks earned in the various subjects and correlations between the marks earned between any two semesters range from 6 to 7 On the other hand, there are certain factors in common between intelligence tests and achievement tests, notably speed of work and the ability to interpret the questions The correlations between the two tests might be lowered somewhat by removing the time limits from achievement tests

A few recent investigations are cited McGehee found that of 589 freshmen engineering students 63 per cent of those placed in the three highest deciles by the American Council Psychological Examination received a letter grade of A Only 10 per cent of those placed in the lowest three deciles received a like grade [59] Langlie reports the results of a freshmen testing program at Wesleyan University carried out between the years 1931–1934 [60] Letter grades ranging from A (top 10 per cent) to E (bottom 10 per cent) were assigned the freshmen on the basis of the aptitude battery The following proportions by letter grade graduated at the end of 4 years A, 82%, B, 83%, C, 60%, D, 39%, E, 31% Of those graduating, 3 out of 5 men in the A group graduated with honors Of the E group 1 out of 20 graduated with like distinction [61]

For the past 20 years intelligence tests have been used extensively in the prediction of college success As such they are

[59] W McGehee, "Freshmen Grades and the American Council Psychological Examinations," *School and Society*, 1938, Vol 47, pp 222–224

[60] T A Langlie, "Intelligence Test Scores and Scholarship," *Journal of Higher Education*, 1938, Vol 9, pp 449–450

[61] See also M G Rigg, "The Relation of College Achievement Tests to Grades and to Intelligence," *Journal of Educational Psychology*, 1939, Vol 30, pp 397–400

widely used as a part of the entrance examination for freshmen It is known that high school grades give as good or slightly better prediction It is also known that the two taken together give a better prediction than either taken alone Leaf obtained a coefficient of 57 between freshman marks and scores on the American Council Psychological Examination, 56 between marks and the Iowa Content Examination scores, and 74 between freshman marks and high school marks [62] Between these three predictive measures and freshman marks he obtained a multiple correlation coefficient of 79 [63]

Regarding the prediction of college grades it should be kept in mind that only about one-third of the high school graduates matriculate in college This one-third tends on the whole to be the most intelligent third Perfect selection does not obtain, but there is rather rigid selection Did all high school students go to college or were those who do go selected at random from the high school population, prediction of success from high school marks and from intelligence tests would be considerably improved We know at once that the lowest one-third, in marks and test intelligence, of high school graduates, cannot succeed in college as colleges are now operated A good share of the next third would have considerable difficulty

Test intelligence and achievement in non-academic subjects Certain abilities are popularly known as special abilities because excellence or deficiency in them is somewhat independent of other abilities Some of these special abilities are said to be non-intellectual because tests designed for their measurement correlate indifferently with those designed to measure intelligence Drawing ability, musical ability, artistic appreciation, and perhaps mechanical ability appear to be vir-

[62] C T Leaf, "Prediction of College Marks," *Journal of Experimental Education*, 1940, Vol 8, pp 303–307

[63] *Cf* C L Nemzek and J H de Heus, "The Prediction of Academic and Non-academic Marks in Junior High Schools," *School and Society*, 1939, Vol 50, pp 670–672, A B Dale, "The Use of Mental Tests with University Women Students," *British Journal of Educational Psychology*, 1935, Vol 5, pp 59–75, and A E Traxler, 'What Is a Satisfactory *I Q* for Admission to College?" *School and Society*, 1940, Vol 51, pp 462–464 F S Freeman, "Applications of Intelligence Tests," *Review of Educational Research*, 1944, Vol 14, pp 20–37

tually independent of intelligence if the necessary minimum of intelligence be presupposed [64]

Fracker and Howard studied the relationship between the performance of 230 college students on the Seashore Musical Test and their performance on a standard intelligence test [65] The results are shown in Table XVIII

TABLE XVIII

CORRELATIONS BETWEEN MUSICAL APTITUDE TESTS AND INTELLIGENCE TESTS

Musical Test	Correlation with *I Q*
Pitch	32
Intensity	01
Time	13
Consonance	09
Tonal memory	10
Rhythm	12

Hevner obtained low negative correlations of — 17 and of — 15 between music appreciation tests on the one hand and intelligence test performance on the other [66] Musical talent has been analyzed into several groups of functions of which the following are illustrative (1) *acoustical,* sense of pitch, time, intensity, timbre, rhythm, consonance, extensity, and volume, (2) *motor,* manipulation of pitch, timbre, intensity, time, rhythm, and volume, (3) *intellectual,* creation, interpretation, memory, and appreciation [67]

[64] F S Freeman gives an excellent treatment of special abilities and disabilities in his *Individual Differences,* Chapter IX New York Henry Holt and Co , 1934

[65] G C Fracker and V M Howard, "Correlation between Intelligence and Musical Talent among University Students," *Psychological Monographs,* 1928, Vol 39, pp 157–161

[66] K Hevner, "A Study of Tests for the Appreciation of Music," *Journal of Applied Psychology,* 1931, Vol 15, pp 575–583

[67] C E Seashore, *The Psychology of Musical Talent* Boston Silver, Burdett, 1919

In the acoustical, or sensory, properties of musical ability, properties for which measures are available, we find little intercorrelation, as for example between pitch and time or pitch and rhythm If lack of significant intercorrelation prevails between the other elements of musical ability it would follow that a musically talented person is one who possesses in rare combination excellence in all or nearly all of the elements If this circumstance actually prevails, an explanation is at hand, as Freeman suggests, of why great talent is so rare

The experimental data pertaining to the relationship between intelligence test performance and excellence in drawing are rather meager In 1919 Manuel reported the results of the determination of *I Q*'s of elementary school, high school, and college students who showed aptitude in drawing [68] These students, while possessing recognized drawing ability, distributed widely on Stanford-Binet test performance Students of good drawing ability were found at various intellectual levels However, from other sources there appears to be a tendency for instances of superior drawing ability to appear with greater frequency at the higher levels of intelligence

Negligible correlations were obtained by Meier between intelligence tests and tests of art judgment [69] The subjects were asked to indicate a preference between a great many pairs of pictures, one member of each pair being a reproduction without distortion, the other being a reproduction with varying amounts of distortion A correlation of — 15 was obtained between the art judgment test and an intelligence test for a group of 55 high school students, and a correlation of — 02 between the two sets of measures for a group of 53 college students [70]

Low positive correlations have been obtained between performance on the various tests of mechanical aptitude and tests

[68] H T Manuel, *A Study of Talent in Drawing* Bloomington, Ill Public School Publishing Company, 1919

[69] N C Meier, "Esthetic Judgment as a Measure of Art Talent," *University of Iowa Studies Series on Aims and Progress of Research*, 1926, Vol 1, No 19

[70] *Cf* H A Carroll and A C Eurich, "Abstract Intelligence and Art Appreciation," *Journal of Educational Psychology*, 1932, Vol 23, pp 214–220

of intelligence, the correlations ranging typically from near zero to about 30 [71]

GROWTH IN TEST INTELLIGENCE

Several problems connected with intellectual growth, as measured by intelligence tests, have been investigated, the following of which are discussed in this connection age of maturity, form of growth curve, form of curve for dull, average, and bright children, and stability of individual curves These problems have been under investigation for two or three decades and have very recently received fresh impetus from the Forty-third Yearbook of the National Society for the Study of Education [72] In most respects the recent investigations have corroborated the earlier ones

Age of test maturity In general terms it may be said that test maturity, and, operationally, intellectual maturity, is not reached earlier than about 20 years of age This conclusion is not necessarily out of harmony with the practice of taking 15 or 16 as the average adult *M A*, as a practical expedient in measurement

Several years ago Thorndike examined several thousand representative high school pupils ranging in age from 13 to 19 years, and re-examined them a year later Practice effects were eliminated by means of a control group Significant increments in test scores were obtained between the first and second testing, allowances being made for practice effects, at all age levels, affording evidence of increased scoring power with age up to 19 [73] These findings were confirmed by Freeman and Flory [74]

[71] J L Stenquist, "Measurements of Mechanical Ability," *Teachers College, Columbia University, Contributions to Education*, No 130, 1923 J Allenborough and M Farber, "The Relation between Intelligence, Mechanical Ability, and Manual Dexterity in Special School Children," *British Journal of Educational Psychology*, 1934, Vol 4, pp 140–161

[72] *Adolescence* Forty-third Yearbook, Part I, National Society for the Study of Education Chicago Department of Education, The University of Chicago, 1944

[73] E L Thorndike, "On the Improvement in Intelligence Scores from Fourteen to Eighteen," *Journal of Educational Psychology*, 1923, Vol 14, pp 513–516, and E L Thorndike, "On the Improvement of Intelligence Scores from Thirteen to Nineteen," *Journal of Educational Psychology*, 1926, Vol 17, pp 73–76

[74] F N Freeman and C D Flory, "Growth in Intellectual Ability as

The latter made use of what is known as the longitudinal method, namely that of examining the same children year after year This method eliminates a problem inherent in the cross-section method, that of making sure that the age samples are drawn from comparable segments of the general population This is not, however, an insurmountable problem All standardization procedures in intelligence testing are predicated upon the comparability of the successive age samples Experience has shown that this condition is not extremely difficult to achieve At least there are no theoretical difficulties inherent in the cross-section method However, for purposes of determining individual differences in development of test intelligence the longitudinal method has obvious advantages Freeman and Flory's subjects were examined yearly, on or about their birthdays, from 8 to 17 years of age, a few cases, 26, from 8 to 19

In the two foregoing investigations yearly increments are expressed in raw score points These may be quite unequal in value A difference of 10 score points at one position on the scale may be smaller or greater than a difference of 10 score points at another position Scaling techniques have been utilized in an effort to overcome this difficulty, as in Thurstone's method of absolute scaling Jones and Conrad, going a step farther, have transformed the absolute scores into percentages of adult achievement Figure 5 presents an intellectual growth curve derived by them from an application of the foregoing treatment to three sets of data, as indicated [75] The reader will observe that this is the curve for approximately the upper half of the measurable growth period The authors make the point that 50 per cent of adult status is reached at age 11 or shortly thereafter [76]

We have spoken of 20 as the year, approximately, at which

Measured by Repeated Tests," *Society for Research in Child Development*, Monograph, 1937, Vol 2, No 2

[75] L L Thurstone, "A Method of Scaling Psychological and Educational Tests," *Journal of Educational Psychology*, 1925, Vol 16, pp 433–451

[76] H E Jones and H S Conrad, *Adolescence*, Forty-third Yearbook, *op cit*, p 153 Reproduced by courtesy of the publishers

yearly increments in intelligence test achievement cease to appear, although it must be admitted that the years immediately beyond have not been studied very extensively [77] This cessation in test-score increments would be of limited value if it did not give some indication of an approach to the upper limit of intellectual growth While contending that it does give

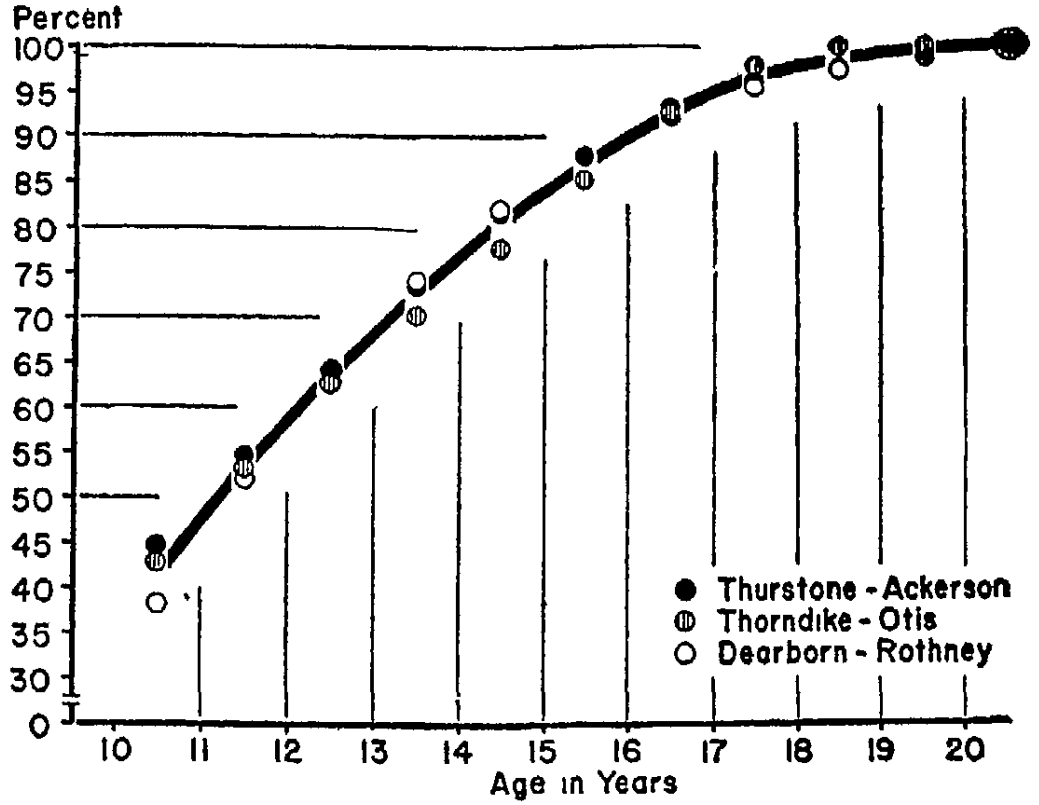


FIG 5 MENTAL GROWTH CURVES IN PERCENTAGE OF MATURE STATUS

such an indication, we should not be prejudiced against the possibility that some unmeasured features of intellectual growth continue beyond this point Intellectual growth may be featured by qualitative as well as quantitative changes The difference between an *M A* of 15 and one of 10 may be something more than additions to the powers represented in an *M A* of 10 The pupil at 15 may have some intellectual qualities he did not possess at 10, as well as more of the same qualities At least this is a possibility Conceivably, intellectual growth in qualities unmeasured by our tests may continue beyond the age at

[77] *Cf* T R McConnell, "Changes in Scores on the Psychological Examination of the American Council on Education from Freshman to Senior Year," *Journal of Educational Psychology*, 1934, Vol 25, pp 66–69

which increments in test scores are obtainable At the same time it must be admitted that this is purely speculative, and there is no very obvious reason to suppose it does do so

Form of intellectual growth curves *M A* scores cannot be used for purposes of determining the form of general intellectual growth curves Mental age scales are so designed that

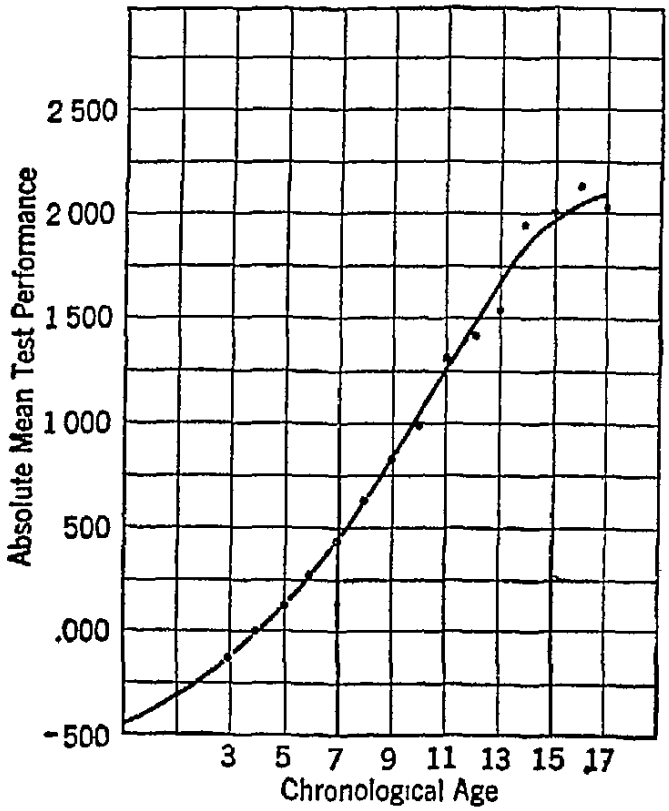


FIG 6 INTELLIGENCE GROWTH CURVE

M A equals *C A* If the test is well standardized, the plotting of *M A* against *C A* will, for the general population, give a straight line Raw scores likewise do not lend themselves to such treatment because of the probable inequality of the items Scaling techniques, mentioned earlier, have been used chiefly Some form of standard score is plotted against *C A*

However, standard scores may yield different curves for different tests We may safely speak only of the form of curve for a particular test Of the tests that have been used in the plotting of growth curves, a majority have yielded curves of the type presented in Figure 6, showing slight positive acceleration

up to the age of 11 or 12, and negative acceleration thereafter [78] One of the most notable exceptions to this form of curve is that obtained by Thorndike [79] for his well-known test *C A V D*, which gave evidence of early negative acceleration [80]

There is also the question of the comparative form of growth curves for dull, average, and bright children It may be said that they are essentially similar in shape and appear to reach an asymptote at about the same *C A* There formerly prevailed an opinion that dull children attain their maximum intellectual stature at an earlier age than average and bright children, thus placing them under the double handicap of developing more slowly and ceasing to develop at an earlier age There has been no confirmation of this opinion Indeed Freeman and Flory have obtained some slight evidence that dull children (their dull group was only a little below average) tend to continue their intellectual development longer than their bright group [81] Others have not found this to be the case The best opinion at present seems to be that the growth curves for dull, average, and bright children are essentially the same in shape [82]

Stability of individual curves The two preceding curves are averages of records for a large number of cases There is no *a priori* reason to suppose that individual curves all follow this pattern Granting that most individuals reach their maximum test performance by the age of 20, there is no reason to suppose that some may not attain the maximum at a later age

[78] L L Thurstone and L Ackerson, "The Mental Growth Curve for the Binet Tests," *Journal of Educational Psychology*, 1929, Vol 20, pp 569–583 Figure reproduced from J B Stroud, *Educational Psychology*, by courtesy of The Macmillan Co , the publishers

[79] E L Thorndike, *et al*, *The Measurement of Intelligence* New York Bureau of Publications, Teachers College, Columbia University, 1927

[80] *Cf* M Stickel, "Items on Gesell's Developmental Schedule Scaled," *Journal of Educational Psychology*, 1932, Vol 23, pp 99 ff M L Williams, "The Growth of Intelligence as Measured by the Goodenough Drawing Test," *Journal of Applied Psychology*, 1930, Vol 14, pp 239 ff

[81] *Op cit*

[82] *Cf* C L Odom, "A Study of the Mental Growth Curve with Special Reference to the Results of Group Intelligence Tests," *Journal of Educational Psychology*, 1929, Vol 20, pp 401–416 H S Conrad, F N Freeman, and H E Jones, "Differential Mental Growth," *Adolescence*, Forty-third Yearbook, *op cit*

or that some, perhaps many, may not attain it at an earlier age While average curves are smooth and regular in appearance, there is no reason to suppose that individual curves may not be quite irregular

These matters are by no means easy to settle If for the sake of discussion we grant that intellectual growth of all individuals is featured by the regular progression shown in the composite

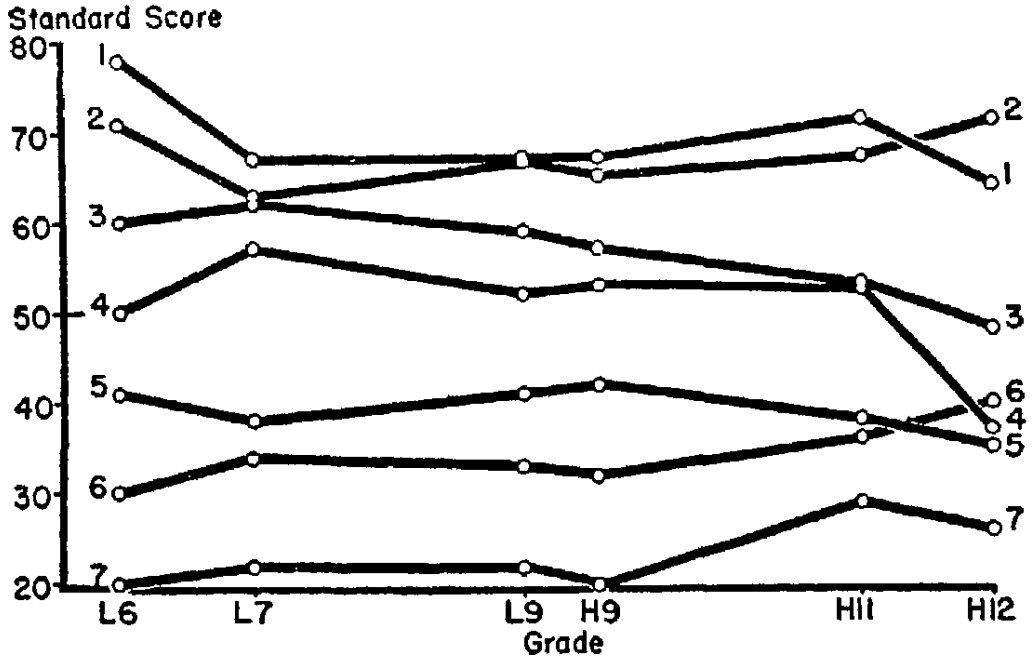


FIG 7 INDIVIDUAL MENTAL GROWTH CURVES IN STANDARD SCORES (GIRLS)

curves, the individual curves plotted in terms of test scores would not as a matter of course show regular progression The performance of human beings is variable The tests are not perfectly reliable We never have a child's *true I Q*, for example, at any one age level, we have an *obtained I Q* (See Chapter IX) With a test having a reliability coefficient of 92, which is about typical, we have a *P E* of slightly more than 3 I Q points Thus it is always a question of whether a deviation in test score represents an error in measurement or a change in rate of intellectual growth

Knowing the *P E* of a test, we may establish, by conventional statistical procedures, the probability that a given deviation is a function of chance, as seen in the previous chapter For the case in point we may expect an obtained *I Q* to deviate from

the true *I Q* by 9 points (3 *P E*) above or below — a range of 18 points — by chance about one time in 21, and to deviate 6 points, above or below, about once in 4 5 times Thus to talk with much confidence about fluctuations in individual curves, we should have to set up limits, in terms of the known reliability of the test in question (and of the *I Q* level in question — Chapter IX) within which we would expect deviations by chance with a given probability

Admitting that there are unknown fluctuations in rate of intellectual growth and known fluctuations in test scores owing to chance, we are still warranted in stating that intellectual growth as measured has considerable stability A child who is shown by a succession of yearly testings in his youth to be dull, average, or bright, is not likely to deviate from one of these categories so widely by the time he reaches adulthood as to deserve a ranking in another of the categories Figure 7 is illustrative A deviation of 10 standard-score points equals 1 *S D*, or, on the Stanford-Binet test, about 16 *I Q* points [83]

DECLINE IN TEST INTELLIGENCE

We now have very pertinent and fairly conclusive data relative to the stability of mental ages of adults ranging all the way

TABLE XIX

RELATIONSHIP BETWEEN MENTAL AGE AND CHRONOLOGICAL AGE

C A	N	M A	C A	N	M A
15–19	51	17 5	55–59	56	15 4
20–24	40	17 3	60–64	50	15 1
25–29	40	17 4	65–69	53	14 3
30–34	43	16 8	70–74	42	14 1
35–39	44	16 7	75–79	26	13 0
40–44	48	16 5	80–84	13	11 6
45–48	42	16 6	85–89	5	11 10
50–54	63	15 11			

[83] Jones and Conrad, *op cit*, p 160 Reproduced by courtesy of the publishers

from early maturity to old age Miles and Miles administered the Otis Self-administering Intelligence Test to 823 persons ranging in age from about 15 to about 90 years The mean mental ages as obtained with 617 cases in City B for the various ages arranged in class intervals of five are shown in Table XIX [84]

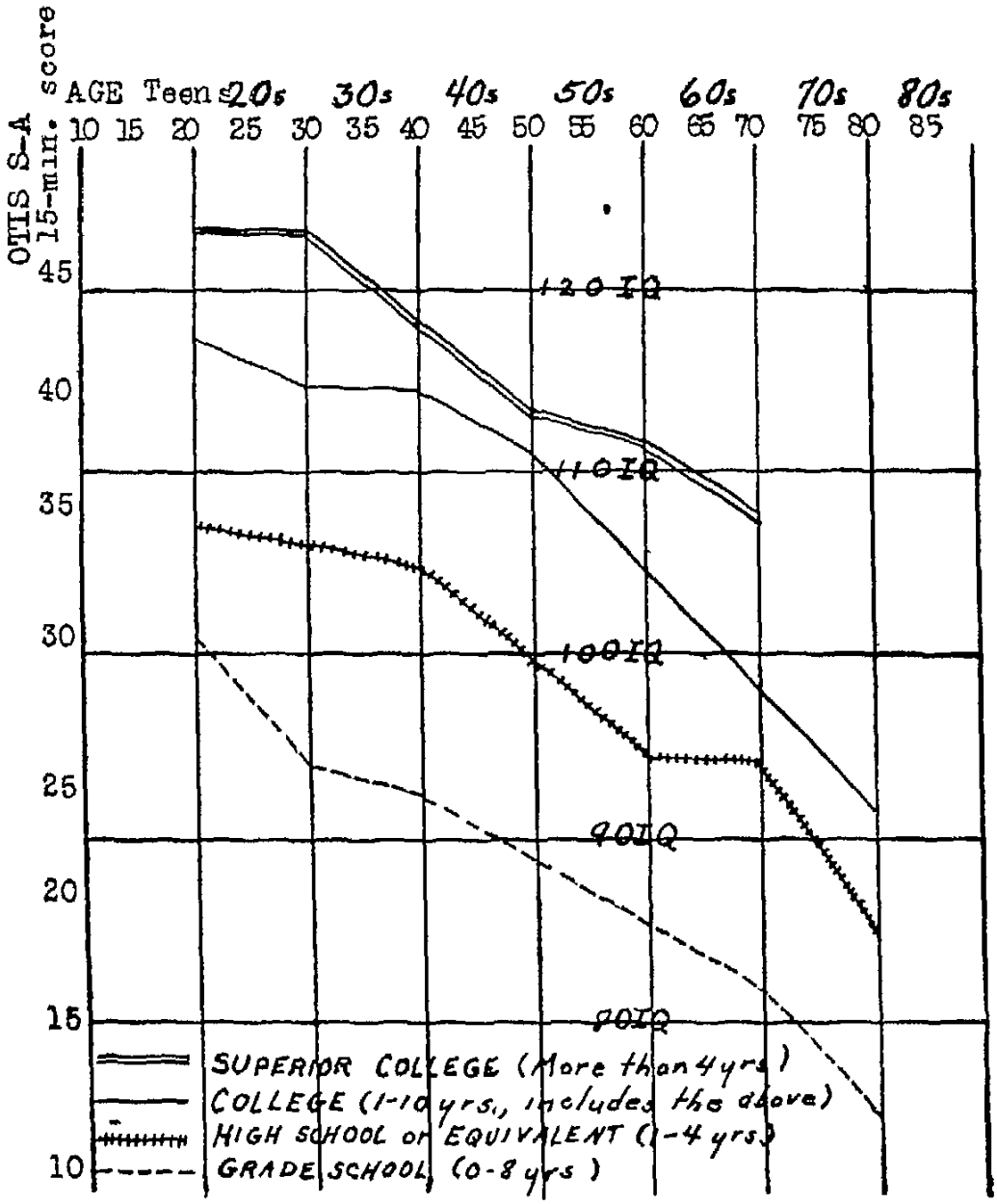


FIG 8 DECADE DISTRIBUTIONS OF MEAN INTELLIGENCE SCORES FOR GROUPS REPRESENTING FOUR EDUCATIONAL LEVELS (DATA FROM BOTH CITIES COMBINED)

[84] C C and W R Miles, "The Correlation of Intelligence Scores and Chronological Age from Early to Late Maturity," *American Journal of Psychology*, 1932, Vol 44, pp 44–78

The unmistakable tendency for mental age to decline from early maturity onward is also illustrated by the correlation procedure They obtained coefficients of approximately — 50 between chronological age and mental age The results in relation to schooling are shown graphically in Figure 8

The data reported above were confirmed the following year by an investigation conducted by Jones and Conrad[85] They administered the Army Alpha intelligence tests to 1191 subjects between the ages of 10 and 60 residing in nineteen New England villages The villages were so selected as, in the opinion of the authors, to provide a fair sample of the rural population (of Massachusetts, Vermont, and New Hampshire)

By a special treatment of his data, which we cannot here describe, Lorge has shown that some of the decline in test intelligence incident to increasing age (after maturity) is due to a decline in speed of work However, even on the untimed test I E R Intelligence Scale *C A V D* he obtained for his subjects (N = 143) a coefficient of — 30 between *C A* and test scores The average coefficient for five group tests, with time limits imposed, for the same group is — 45[86]

[85] H E Jones and H S Conrad, "The Growth and Decline of Intelligence," *Genetic Psychology Monographs*, 1933, Vol 13, No 3

[86] I Lorge, "The Influence of the Test upon the Nature of Mental Decline as a Function of Age," *Journal of Educational Psychology*, 1936, Vol 27, pp 100–110

CHAPTER XI

FOUNDATIONS OF LEARNING

LOCKE

To John Locke (1632–1704) credit is usually given for the momentous doctrine that all knowledge is derived basically through sensory experience Hobbes had introduced the doctrine in 1650, 40 years before the final draft of Locke's famous *Essay Concerning Human Understanding* made its appearance But it remained for Locke to defend the position with great force and show how knowledge is so derived Moreover, Locke's work is pointedly set over against that of Descartes (1596–1650) who had espoused then so recently and so vigorously the doctrine of innate knowledge, with the result that Locke and Descartes are customarily represented as contrasts in presenting the point of view of each

This doctrine stands as one of the great contributions to human understanding It is of the greatest educational importance, although Locke's greatest influence upon education was made in a more direct way in his *Some Thoughts Concerning Education* The following excerpts show first his position regarding the origin of ideas and second some of his practical notions regarding education

The origin of ideas

Now since in the order of time external experience comes first, the proposition is true that ideas are coeval with sensation But experience is not only the origin in time of knowledge, I find I am absolutely dependent upon experience for the kind of ideas I can have and the manner in which I have them Simple ideas are the data for knowledge, in respect of these data my mind is passive and receptive rather than spontaneous and originative, I cannot create these single ideas at will, I am bound to have them, and to have them as they are determined by my experience, and in relation to the experience my mind is a *tabula rasa* upon which there can be no characters until there is the action of something upon it [1]

[1] J E Russell, *The Philosophy of Locke* (extracts from *The Essay Concerning Human Understanding*) New York Henry Holt and Co , 1891

Let us then suppose the mind to be, as we say, white paper, void of all characters, without any ideas, how comes it to be so furnished? Whence comes it by that vast store, which the busy and boundless fancy of man has painted on it with an almost endless variety? To this I answer, in one word, from experience Our observation, employed either about external sensible objects, or about the internal operations of our minds, perceived and reflected on by ourselves, is that which supplies our understandings with all the materials of thinking These two are the fountains of knowledge, from whence all the ideas we have, or can naturally have, do spring

Thus the first capacity of human intellect is, that the mind is fitted to receive the impressions made on it, either through the senses by outward objects, or by its own operations when it reflects on them This is the first step a man makes towards the discovery of any thing, and the ground-work whereon to build all those notions which ever he shall have naturally in this world [2]

On the nature of ideas The teaching is rather prevalent among modern writers on psychology that the thinkers of Locke's period showed a great prochivity toward the reification of ideas, that they regarded ideas as permanent, independent, and revivable entities In refutation the following is offered

But our ideas being nothing but actual perceptions in the mind, which cease to be anything when there is no perception of them, this laying up of our ideas in the repository of the memory signifies no more but this, — that the mind has a power, in many cases, to revive perceptions which it has once had, with this additional perception annexed to them, — that it has had them before And in this sense it is that our ideas are said to be in our memories, when indeed they are actually nowhere, but only there is an ability in the mind when it will to revive them again, and, as it were, paint them anew on itself, though some with more, some with less, difficulty, some more lively, and others more obscurely [3]

On formal discipline

Another thing very ordinary in the vulgar method of grammar-schools there is, of which I see no use at all, unless it be to baulk young lads in the way to learning languages That which I mean, and here complain of, is, their being forced to learn by heart, great parcels of the authors which are taught them Languages are to be learned only by reading and talking, and not by scraps of authors got by heart, which when a man's head is stuffed with, he has got the just furniture of a pedant, and 'tis the ready way to make

[2] *Ibid*, p 35

[3] *Ibid*, pp 52–53

him one, than which there is nothing less becoming a gentleman For what can be more ridiculous, than to mix the rich and handsome thoughts and sayings of others with a deal of poor stuff of his own [4]

I hear it is said, that children should be employ'd in getting things by heart, to exercise and improve their memories I could wish this were said with as much authority of reason, as it is with forwardness of assurance, and that this practice were established upon good observation more than old custom for it is evident, that strength of memory is owing to a happy constitution, and not to any habitual improvement got by exercise [5]

Other utterances of Locke are equally pointed in opposition to what many years later was called *formal discipline* by those who professed to know better One wonders who the disciples of formal discipline were unless they were the poor schoolmasters "When Scott wishes to give a reason for Reuben Butler's occasional errors of judgment, he uses the palliative parenthesis 'for the man was mortal, and had been a schoolmaster'" [6] Locke knew better, Herbart knew better, later English scholars knew better At any rate, educators whose writings are replete with opinions against formal discipline are unable to do much better when they wish to cite an early advocate of the doctrine than mention Robert Recorde's book on algebra, 1557, which bore a suggestive title, *The Whetstone of Witte* Locke's insistence upon the practical in education — recreation, fencing, riding, drawing, and shorthand and law — and his perorations against grammar, rhetoric, and Latin themes support the foregoing quotations, as does also the following "And if *Xerxes* was able to call every common soldier by name in his army that consisted of no less than an hundred thousand men, I think it may be guessed, he got not this wonderful ability by learning his lessons by heart when he was a boy" [7] Notwithstanding these succinct pronouncements against the notion of formal discipline, Locke is sometimes referred to as one of its original advocates

[4] John Locke, *Some Thoughts Concerning Education*, p 153 (Edited by R H Quick) London Cambridge University Press, 1884

[5] *Ibid*, p 154

[6] Sir John Adams, *The Herbartian Psychology Applied to Education*, p 1 Boston D C Heath and Co, 1897

[7] Locke, *ibid*, *p* 154

Locke's influence on education Locke's influence on education has been indirect, chiefly "Teachers pour over Locke," wrote Sir John Adams in 1897, "from their first course in school management until the fateful day when they make their way into the world, there to put into practice the Locke they learned, and this in many instances with scarcely more than having heard his name"[8] Locke's influence on English and American education has been in large measure second-hand, having come by way of Germany, notably through Herbart The matter is well summed up by the Reverend Mr Quick in the preface to his edition (1884) of Locke's *Some Thoughts Concerning Education*

> The Germans, who hitherto have had the history of education in their own hands, have uniformly attributed an important part in it to one Englishman and one only — the philosopher Locke, and their first well-known historian, F H Ch Schwarz, has asserted that "modern pedagogy is more or less directly the pedagogy of Locke" But so little has been thought of education in this country [England] that our one classic has never been carefully edited, and has now been for some time "out of print"[9]

HERBART

Johann Friederich Herbart (1776–1841), beginning the productive period of his life a little more than a hundred years after the publication of Locke's classical *Essay*, made a forceful and lucid educational interpretation of Locke's philosophical teaching He is best known to students of education for his application of the concept of *apperception* to mental development (treated in Chapter IV) and for his *formal steps* in teaching Locke had derided the school-masters for their attempts to train the faculties of mind *formally* by putting their pupils to learning by heart, to studying rhetoric and converting English prose into the Latin, but it remained for Herbart to show how education does produce mental development

The formal steps The formal steps of the Herbartians lost popularity not because of unsoundness of the psychological principles upon which they are based, but because of their

[8] *Op cit*, p 33

[9] R H Quick, *op cit*, p xii

formal aspects Perhaps no person, unless it be Dewey, has influenced educational thought so profoundly

One could predict today that much time would be wasted in taking all students through each step formally, even if plausible means of doing so could be worked out for each item of learning Teaching by the formal steps is quite likely to be stereotyped The charge, "Vous voulez mechanizer l'Education" was indeed partially justified This admission does not detract from the soundness of Herbart's analysis of the psychological processes by which a pupil arrives at a useful understanding Thus the formal steps are here described, briefly, not because they provide good models for present day teaching, but because of the light they shed on the fundamental processes of learning

(1) *Preparation* By preparation Herbart meant the preparation of the child to perceive, the giving to the mind the desired set, the arousal of interest and expectation Moreover, if the pupil's background of experience is inadequate for a particular instructional purpose, it should be made adequate before presentation of the new material begins

(2) *Presentation* The guiding principle in presentation is clear from the general meaning of apperception instruction is predicated upon the available fund of previous experience, presentation of the new in terms of the old, the unfamiliar in terms of the familiar This of course was not a discovery peculiar to the Herbartians, but it is to their credit that they committed themselves to a program of ascertaining what the child's existing store of knowledge was and of adapting instruction thereto As an example of a representative attempt at a statistical treatment of the "content of the child's mind," the following investigation reported by Lange in 1878 is cited Of 500 city children, in 33 people's schools, 82 per cent had no idea of a sunrise, 37 per cent had never seen a grain field, 49 per cent a pond, 82 per cent an oak, 29 per cent a river bank, 52 per cent had never been on a mountain, 50 per cent had never been in a village [10] These surveys were forerunners of those

[10] K Lange, *Apperception a Monograph on Psychology and Pedagogy*, pp 160–161 Boston D C Heath and Co , 1896 Translated by members of the Herbart Club

made in America by G Stanley Hall in which his "questionnaire" figured so prominently

As stated in Chapter VI, there are two conditions requisite to instruction's being meaningful first, the symbols of instruction should have meaning and, second, the learner should have a sufficient previous knowledge to permit him to understand the instruction Both of these conditions are clearly implicated in the first and second steps of Herbart

A cardinal point, but not a necessary one, in the method of presentation for the early Herbartians, and perhaps the weakest in their whole armor, was their adherence to the "culture epochs" theory of education — an educational adaptation of the doctrine of recapitulation [11] This doctrine assumed that the anatomical traits of a particular member of a species appear in embryonic development in the direct order of their appearance in phylogenetic development — that the ontogeny repeats the phylogeny Similarly the proponents maintained that instinctive, emotional, and other mental traits of the individual child recapitulate his phylogenetic history Each child in the course of his development, and each animal, presents, according to this doctrine, a sort of abbreviated history of his race Educators became interested in the order of emergence of these mental traits The instructional materials for any given stage in a child's development were to be drawn from the appropriate corresponding stage in racial development Moreover, each stage, no matter how destructive, or uncivilized, was to be respected, the stage of barbarism, it was argued, should occasion no particular alarm, it would not persist, but would disappear when it had served its purpose in the life of the child Appropriate is Hall's classical remark, "Permit the frog to be a tadpole before becoming a frog

To endeavor to hurry up the process by cutting off the tadpole's tail results in spoiling both the tadpole and the frog" [12]

[11] *Cf* F E Bolton, *Principles of Education,* Chapter VI New York Charles Scribner s Sons, 1910

[12] Quoted from J M Fletcher, *Psychology in Education,* p 16 New York Doubleday, Doran and Co , 1934

Normal young children are full of animal life, and very little reflective and not at all religious In fact, we may say ideally their growth should be that of a healthy animal Spirituality will appear later if the child has developed a sound physical nature Children are little savages and this should not alarm us They will emerge from savagery to sedate civilization in due time if we simply afford them opportunity to work their way upward as the savage was obliged to do [13]

The application of the doctrine of recapitulation as worked out in terms of culture epochs is well expressed by Ziller, as follows

The mental development of the child corresponds in general to the chief phases in the development of his people or of mankind The mind-development of the child therefore cannot be better furthered than when he receives his mental nourishment from the general development of culture as it is laid down in literature and history Every pupil should accordingly pass successively through each of the chief epochs of the general mental development of mankind suitable to his stage of advancement [14]

The material of instruction " should be drawn from the thought-material of that stage of historical development in culture which runs parallel with the present mental state of the pupil " Spencer voiced similar ideas [15]

A word of comment will suffice The culture epochs theory fails at the very start A pupil who has not assimilated a vast amount of the cultural life about him cannot even make a start toward learning the cultural history of his race For all we know, the Magdalenian man who shaped his tools from stone 20,000 years ago had the mental capacity to assimilate the culture of a modern variety and complexity History is not wanting in instances of peoples' falling precipitously to a low from a former high state of civilization *That which maintains civilization is civilization itself, not something that the achieving of civilization did to the germ plasm of the race* The obvious fact that civilization may go backward as well as forward is difficult to harmonize with any concept that looks upon mental

[13] Bolton, *op cit*, p 93 Reproduced by courtesy of the publishers

[14] Quoted from Lange, *op cit*, pp 110–111

[15] H Spencer, *Education*, pp 117–118 New York D Appleton Co, 1860

development as a natural unfolding of biologically determined traits

(3) *Association* What new understandings the pupil may gain depend upon the assimilation of the new precept and the existing and available store of ideas, as has already been noted But from the standpoint of method this step had a deeper significance and purpose It was preliminary to abstraction By carefully guiding the pupil, by leading him to make certain associations between the new and the old, he may arrive at *general knowledge* This step does not seem so formal, and indeed so sterile, when it is realized that it was used by many of the later proponents at least as a period of further study and thought It was not something that happened after learning but was a part of it The second step, presentation, has actually come to mean preliminary presentation and as such is in part a form of preparation

(4) *System* The fourth step, system, is a logical extension of the third The new material of instruction is classified — a process said to be the final step in arriving at general, as opposed to particular, knowledge Classification involves "(1) the separation of the notional from the concrete, (2) the formulation of the statement of the notional in language, (3) the placing of the concept thus attained in its proper place in already formed series of concepts . , (4) the repetition and securing of the concept" [16]

(5) *Application* The applications of learning were not left to chance in the Herbartian system Provision was made for *formal* application in each lesson unit This step may be accepted as a cardinal principle of teaching today, if the word *formal* be omitted Indeed, application is little short of a password in the teaching of science and the social studies in high school today

The five formal steps are capable of substantiation from a psychological point of view The force of Lange's argument "To instruct according to the formal steps means, then, to do

[16] Quoted from B Mulliner, Introduction to J F Herbart, *The Application of Psychology to the Science of Education*, p cxi New York Charles Scribner's Sons, 1898

persistently and with conscious purpose what remained otherwise given over to a happy intuition"[17] is lessened chiefly by such considerations as practical limitations, the unwieldiness of the method, and its suppression of spontaneity

The character of mental development No other psychological contribution has influenced education so profoundly and for so long a time, and indeed none (probably) has offered so much toward the understanding of the conditions of mental development From their earliest history philosophers, as Adams points out, had indulged themselves in the attempt to explain how the *mind* manipulates ideas, *makes, acquires, reproduces,* and *combines* them[18] Herbart sought to explain the mind in virtue of the ideas Like Locke, Herbart rejected innate ideas For neither of them was mental development an unfolding of biologically determined capacities that would surely assert themselves in the due course of time if the child was properly fed Without education the mind would never develop to human proportions at all This conception ascribes to those factors that pass by such names as experience or education or learning not only a tremendously important role but a necessary role in mental development, and is thus complementary to the position taken in the earlier chapters of this volume, namely that human nature is an acquirement, not something that exists at birth or unfolds as a process of biological maturation, due allowance being made for innate capacities

To sum up, the mental reception any new idea gets is influenced by the fund of existing ideas of the individual to whom it is presented One's reaction to a new situation depends, in part, upon his previous reactions to other similar situations Words, perfectly familiar words, do not mean the same thing to the mature teacher and the immature pupil Moreover, the difficulty is not resolved when we substitute objects and things for words The pupil does not see the same thing in an object that the teacher sees One of the great functions of education is the furnishing of an adequate background with which to apprehend and interpret the facts of the world as they are pre-

[17] *Op cit*, p 240 [18] Sir John Adams, *op cit*, pp 44 ff

sented to the senses "The best-educated human being is he who has the biggest and best-arranged apperception masses dealing with the life he is likely to lead" [19]

Herbart's influence Although it might be difficult to find an educator today who would admit to being a Herbartian — no educator could stand to be so old-fashioned — Herbart's influence on educational method is still very great, both directly and indirectly For example, at the secondary-school level some of the espousers of the unit plan, notably C A and F M McMurry and, more recently, H C Morrison, have adapted the Herbartian steps to this plan For the first step the McMurrys retained the Herbartian term *preparation,* Morrison adopted the name *exploration* For the second step both retain the term *presentation* Here the former made large use of the Socratic method, the latter, the telling method This step has had the purpose of orienting pupils to a period of further study Thus this step is in part a preparation for the third step *association* (Herbart), *assimilation* (Morrison) and *comparison* and *abstraction* (the McMurrys) This is essentially a period of study and thought In place of *systematization,* Herbart's name for the fourth step, Morrison used *organization,* the McMurrys, *generalization* For the fifth step the McMurrys retained the term *application,* Morrison substituted the term *recitation* [20]

Lesson plans are still built around the Herbartian five steps The unit plan of teaching lends itself well to the setting of problems, without which, as Bode says, lesson plans become an obstacle to education [21] In the modern adaptations of the five steps it is frankly recognized that there is much functional overlapping of the steps In practice the steps do not, of course, necessarily follow each other in the temporal order suggested Learning is not so orderly The various steps do not each await their turn Generalization, tentative generalization, may, and should, take place while the student is compiling information

[19] Adams, *op cit*, p 75

[20] *Cf* R O Billett, *Fundamentals of Secondary-school Teaching,* Chapter XVI Boston Houghton Mifflin Co, 1940

[21] B H Bode, *How We Learn,* p 154 Boston D C Heath and Co, 1940

Application does not wait till all generalizations have been made To repeat, the five steps have lost their "formal" aspects, but are still our best description of a complete act of learning (*Cf* Chapter XIII)

ASSOCIATIONISM

Associationism represents a school of psychological thought, principally British, which elevated association to a position of prime importance Indeed it became the chief explanatory principle As a school of thought it may be said to have begun with Hartley and to have ended, as such, with Bain and Spencer Other notable adherents were Brown and James and J S Mill Perhaps Herbart rightfully belongs to the group

The single term *association* characterizes the interworkings of mental processes more adequately than any other in the literature In traditional American psychology, *learning* is all but synonymous with "forming associations", *remembering*, with the functional strength of associations, and *recall*, with the operation of associations Learning may be characterized as the formation of new associative connections between stimuli and responses, or the strengthening or weakening of old ones, in the results of practice, forgetting as the weakening of associative connections, although it is preferable to define learning and forgetting in terms of the observable and measurable, namely in terms of responses

In popular speech we refer to forming associations between things, as between a woodsman and his axe Strictly, this is not the case Rather, associations are formed between one mental event, *woodsman*, and another, *axe*

Hartley Hartley (1704–1757) recognized two kinds of experience, *sensation* and *ideation* and possibly *feeling* Sensations, he averred, are produced by certain vibrations set up in the nerves, spinal cord, and brain as a terminal result of the action of external objects upon the sense organs These vibrations leave certain vestiges of themselves in nerve substance with the condition that they may be repeated without a repetition of the sensation The re-enactment of these vibrations by other than the original exciting agent produces ideas of sensa-

tion Thus did Hartley attempt to supply a physiological basis of sensations and ideas Further, "any sensations, A, B, C, etc, by being associated with one another a sufficient number of times, get such a power over the corresponding ideas a, b, c, etc, that any one of the sensations, A, when impressed alone, shall be able to excite in the mind b, c, etc, the ideas of the rest" [22] A sensation can by association thus instigate an idea but not another sensation, the latter always being dependent upon the excitation of sense organs, however, an idea can associatively instigate another idea If a number of ideas have habitually occurred together, one may serve to instigate the others

Both sensations and ideas may instigate movement associatively, and movement may in turn instigate ideas and other movement Thus the "sixth sense" (the sense of muscular movement) became for Hartley a logical necessity — if movement is to be an instigator, although, in so far as the writer is aware, he did not take this step, a step which was taken nearly a hundred years later by Sir Charles Bell

Thus for Hartley the instigators are sensations, ideas, and movement, although the latter reduces to sensation, and the associatively instigated are ideas, movement, and possibly feeling With respect to feeling Hartley is not very explicit, although he did attempt to encompass it in his system

Thomas Brown The classical laws of association, usually styled the primary laws, *similarity*, *contrast*, and *contiguity*, go back to Aristotle Thomas Brown (1778–1820) accepted the primary laws and added nine so-called secondary laws, as follows [23]

1 Relative *duration* 'The longer we dwell on objects, the more fully do we rely on our future remembrance of them"

2 Relative *liveliness* "The parts of the train appear to be more closely and firmly associated as the original feelings have been more lively"

[22] Quoted from H C Warren, *A History of Association Psychology*, p 53 New York Charles Scribner's Sons, 1921

[23] Th Brown, *Lectures on the Philosophy of the Human Mind*, 1820 Quoted from H C Warren, *op cit*, p 73

3 Relative *frequency* "The parts of any train are more readily suggested in proportion as they have been more frequently renewed"

4 Relative *recency* "Events which happen a few hours before are remembered when there is a total forgetfulness of what happened a few days before"

5 Relative *freedom from alternative associates* "The song which we have never heard but from one person can scarcely be heard again by us without recalling that person to our memory"

6 *Constitutional differences* These differences give "greater proportional vigor to one set of tendencies of suggestion than to another"

7 *Varying emotion of the hour* Variations appear in the same individual "according to the varying emotion of the hour"

8 *Temporary diversities of state* "As in intoxication, delirium, or ill-health"

9 *Prior habits of life and thought* "The influence of ingrained tendencies upon any given situation, however new or irrelevant"

The so-called secondary laws of association, usually styled laws of learning, have found expression in a majority of textbooks in general and educational psychology to this day

The influence of the doctrine of evolution The influence of the doctrine of evolution upon associationism is seen clearly in the writings of Spencer (1820–1903) Boring tells us the "really important novelty in Spencer's psychology is his *evolutionary* doctrine, which amounts to his making the associative law of frequency operate phylogenetically"[24] Accordingly, oft-repeated associations over several generations acquire hereditary properties and thus become transmissible by descent (an erroneous concept of evolution that is usually ascribed to Lamarck) In this Spencer extended associationism to genetics In any event the laws of association were, without violence or distortion, made to envisage behavior, innate or acquired, whereas originally they were meant to cover ideas

[24] E G Boring, *A History of Experimental Psychology*, p 233 New York D Appleton-Century Co , 1929

The concept of evolution, as its influence began to spread to various fields of knowledge, was destined to exert a profound influence upon the history of thought If behind man and each species of animals extends a biological history indefinitely long, and if each represents an instance of evolution still actually going on, then individuals must start life with different potentialities The mind is not quite a *tabula rasa* after all To be sure Locke is not invalidated, in so far as knowledge goes But in the place of innate ideas we have innate behavior, innate dispositions, and innate capabilities It was inevitable that there should ensue the conception that it is much easier to "write" upon some *tabulae* than upon others and that the "inscriptions" endure in greater clarity

What are associated? What may the instigated and the instigating be in association? In his delightful book *Association Theory Today*, Robinson accepts *sensory, perceptual, affective* and *ideational* processes as associative instigators, and *ideas, feelings, movement* (muscular and glandular), and *general sets* as associatively instigated [25] It is interesting to note that Robinson's very clear statement of the prevailing modern viewpoints is not seriously at variance with Hartley's conceptions as formulated 200 years ago

The laws today Of the classical laws of association (contiguity, similarity, and contrast) the status of contiguity has not been seriously questioned Similarity and contrast have enjoyed no such reception and it is difficult to make any very useful historical statement about them

The law of contiguity has been stated as follows *The fact that two psychological processes occur together in time or in immediate succession increases the probability that an associative connection between them will develop – that one process will become the associative instigator of the other* – Robinson It should be pointed out that neither simultaneity nor immediate succession is an essential condition, although the closer the approximation to these conditions the greater is the chance that an associative connection will be formed

[25] E S Robinson, *Association Theory Today*, pp 39–48 New York D Appleton-Century Co, 1932

A significant extension of the classical law of similarity is found in the law of assimilation, which has been stated as follows

"*To any new situation man responds as he would to some situation like it, or like some element of it In default of any bonds with it itself, bonds that he has acquired with situations resembling it, act*" [26]

"*Any novel sense impression will tend to elicit those responses that are already connected with a similar sensory stimulus*" [27]

The laws of association must state, first, the conditions necessary for the formation of associative connections, and second, the conditions that determine associative strength Contiguity and effect pertain to the conditions necessary to the formation of associative connections Frequency, degree of contiguity, duration, liveliness, absence of alternative associates, constitutional differences, and prior habits of life are generalized statements of conditions that govern the variable strength of associative connections – all of which have been verified by a half century of experimentation Brown's *varying emotion of the hour* and *temporary diversity of state* may be reduced to a single formulation, as in Carr's *law of variable subjective condition* [28] Absence of *alternative* associates finds expression in the Mueller-Schumann law of associative inhibition, *prior habits of life* is implicated in all of the literature on transfer of training, and *constitutional differences* is verified in the work on the relationship between intelligence and learning and in much of the work on physiological psychology The latter two laws have found modern expression (by Robinson) in the *law of acquaintance* and the *law of individual differences*, respectively Liveliness has meant attention getting value and effect The latter is probably closer to Brown's usage Recency is a logical deduction from the Ebbinghaus curve and the bulk of work on the temporal rate of forgetting

[26] E L Thorndike, *Educational Psychology*, Vol 2, p 28 New York Teachers College, Columbia University, 1913

[27] Carr, *op cit*, pp 226–227 *Cf* Robinson, *op cit*, pp 86–92

[28] H A Carr, "The Laws of Association," *Psychological Review*, 1931, Vol 38, p 219

The number of laws of association could be considerably extended upon the basis of existing experimental data, if it were deemed useful to do so The number could be made equal to the number of demonstrable conditions of learning and forgetting

E L Thorndike The adaptation of association psychology to the problems of learning, animal and human, is so well exemplified in the work of Thorndike that it seems appropriate to devote some space to his formulations

(1) *Readiness* In 1913 Thorndike recognized three laws of learning, *readiness, exercise,* and *effect,* and five characteristics "secondary in scope" The law of readiness is "when any conduction unit is in readiness to conduct, for it to do so is satisfying When any conduction unit is in readiness to conduct, for it not to do so is annoying" [29] This law has attracted comparatively little attention in systematic writing on learning It is frequently cited in educational literature, perhaps because of the flavorful aura that attends the term *readiness,* as "proof" that the pupil should be put in a favorable attitude to learn — a turn that is not clearly implicated in the statement of the law

(2) *Exercise* The laws of exercise, use and disuse, familiar to every student of psychology and education, are stated as follows "When a modifiable connection is made between a situation and a response, that connection's strength is, other things being equal, increased When a modifiable connection is *not* made between a situation and a response during a length of time, that connection's strength is decreased" [30]

These laws are inferable from Ebbinghaus's data published in 1885 regarding acquisition and retention and are supported by all subsequent work, with but minor exceptions However it is recognized by Thorndike that exercise, *qua* exercise, does little or nothing to improve a connection's strength This position and the experimental data upon which it is based are presented in his *The Fundamentals of Learning* [31] He came to the

[29] E L Thorndike, *op cit*, pp 1–2

[30] *Ibid*, pp 2 and 4

[31] Bureau of Publications Teachers College, Columbia University, 1932

conclusion, in this work, that repetition of a *situation*, repetition without a response being made — without belonging, without the observation being made that this has anything to do with that, repetition without effect or without the operation of some other condition of learning does not lead to learning, but maintains the *status quo* Peterson had questioned the efficacy of sheer repetition (exercise) a decade earlier [32] This conclusion does not affect the validity of the empirical law of frequency as stated by Thomas Brown or by Thorndike in his earlier work

Thus it is concluded that practice, sheer practice, does not insure learning, although practice is a necessary condition to learning This is demonstrated nowhere more clearly than in work phenomena A typist, a linotype operator, a telegrapher may ply his trade for years without measurable improvement *It is the repetition of the conditions of learning that insures learning*

(3) *Effect* Easily the most talked of law of learning is *effect* both in educational and in psychological writing It was stated clearly though in a more limited sense than that envisaged by it today, by John Locke, as is seen in the following "Attention and repetition help much to the fixing [of] any ideas in the memory, but those which naturally at first make the deepest and most lasting impression are those which are accompanied with pleasure and pain" [33] Brown took account of it, probably Others, notably Bain, Spencer, and Baldwin, have made systematic use of the principle In the history of experimental psychology it has received more attention by far than any of the other laws of learning

The following statement of the law is taken from Thorndike's *Educational Psychology* (1913), although he had stated it earlier in connection with his animal experiments "When a modifiable connection between a situation and a response is

[32] J Peterson, "The Backward Elimination of Errors in Mental Maze Learning," *Journal of Experimental Psychology*, 1920, Vol 3, pp 257–280 J Peterson, "Learning When Frequency and Recency Factors Are Negative," *Journal of Experimental Psychology*, 1922, Vol 5, pp 270–300

[33] *The Essay Concerning Human Understanding* Russell's edition, *op cit*, p 53

made and is accompanied or followed by a satisfying state of affairs, that connection's strength is increased When made and accompanied or followed by an annoying state of affairs, its strength is decreased "[34] There is a large literature on *effect* in learning The reader is referred especially to articles by Waters,[35] and by Wallach and Henle[36]

Throughout most of its history and down to the last decade, approximately, *effect* has been used more or less synonymously with *affect* This was clearly the sense of Locke's usage, and also of Spencer's and Bain's and of Thorndike's until recently Spencer,[37] Bain,[38] and Thorndike departed, however, from Locke, in their representation of pleasure and displeasure — satisfiers and annoyers — as having opposite effects Thus to them effect operated bidirectionally, somewhat in the Freudian sense, minus, of course, the notion of repression and other Freudian schema Thorndike's own research, within the last ten or fifteen years, has led him to abrogate the second term in his earlier statement of the law He no longer regards satisfying and annoying states of affairs as having the opposite effects of "stamping in" and "stamping out"

Thus the law of effect has taken a turn away from *affect* and toward greater generality Affect is now regarded as but one kind of *effect* McGeoch states that effect means what happens as a consequence of an act, usually within a few seconds afterward *Thus "acts are fixated and eliminated as functions of their effects"* A more comprehensive statement and one that states the kinds of consequences that lead to continuance or repetition of an act, on the one hand, and to avoidance or elimination, on the other, is the following *'Other things being equal, acts leading to consequences which satisfy a motivating condition are selected and strengthened, while those leading to*

[34] *Ibid*, p 4

[35] R H Waters, "The Law of Effect as a Principle of Learning," *Psychological Bulletin*, 1934, Vol 31, pp 408–425

[36] H Wallach and M Henle, "An Experimental Analysis of the Law of Effect," *Journal of Experimental Psychology*, 1941, Vol 28, pp 340–349

[37] H Spencer, *The Principles of Psychology* New York D Appleton-Century Co, 1873, Vol 1

[38] A Bain, *The Senses and the Intellect*, Third edition London Longmans, Green and Co, 1868

consequences which do not satisfy a motivating condition are eliminated" [39]

At present the efficacy of effect is not attributed directly to pleasurable after-effects, as such, at least not to sensuous ones, but rather to a "confirming reaction," a sort of "biological re-enforcement," or tension reduction "The confirming reaction seems to issue from some want or 'drive' or purpose of the organism The larger pattern of goals and strivings of the individual determine what results shall be experienced as satisfiers, as fitting and good in that situation and what confirming reaction shall be elicited" The effectiveness of a consequence as a re-enforcing factor is said to depend upon the degree to which the consequence is observed to "belong" to the act that led to the consequence [40] (It may be well to bear in mind that effect, confirming reactions, re-enforcement, and tension reduction are *names*)

It might be a bit awkward if, in the classroom, the teacher had to provide some externally controlled means of inducing re-enforcement or the confirmatory response for each item of instruction Fortunately, this activity takes care of itself as a self-regulatory event — an instance "of the organism's own potency in influencing its own course of learning" [41] — provided two conditions are met, namely (1) that the pupil is motivated to some degree and (2) that he has knowledge of his success or failure That is to say, re-enforcement or effect is an inevitable concomitant of the two foregoing conditions It is also interesting to note that the re-enforcing or confirming response tends to operate somewhat on the all-or-none principle Once a low threshold — a low effective level of re-enforcement — is passed, additional increments do not appear to produce additional increments of learning

[39] J A McGeoch, *The Psychology of Human Learning, an Introduction*, p 574 New York Longmans, Green and Co , 1942 See also H A Carr, *Psychology*, pp 93 ff New York Longmans, Green and Co , 1925

[40] A I Gates, "Connectionism Present Concepts and Interpretations," *The Psychology of Learning*, Forty-first Yearbook, Part II, Chapter IV, National Society for the Study of Education Bloomington, Ill Public School Publishing Co , 1942

[41] Gates, *ibid*

(4) *Belonging* The laws of association discussed in this chapter state conditions under which the probability that one mental event will instigate another increases These are likewise the conditions of learning and remembering Have all of the major conditions been stated? Specifically, is understanding, an ostensibly important condition in practically all academic learning, adequately taken account of in the foregoing formulations of the laws of association?

Obviously a student could learn to go through all of the steps necessary to solving the problem $\sqrt{72195}$ without any aid from understanding Contiguity, frequency, prior habits of life, constitutional differences, effect, and possibly others, state the generalized conditions of such an act of learning But is the difference between understanding and not understanding, a condition that in this instance makes the differences between a useful and a useless learning event, and the difference between the tedium of rote learning and the swift, orderly progress of logical learning, provided for in these or any of the other laws afore stated? Probably no one has ever denied that learning which is susceptible to understanding proceeds much faster when such understanding is present than when absent The only question at issue is whether or not it is adequately accounted for in the foregoing laws

It seems quite probable that understanding can be reduced to effect, or at least depends upon effect in the last analysis for its efficacy, but reducing it to something else does not eliminate it It is likely that learning does not go on in the absence of re-enforcement or of confirmatory response In many learning situations — in most such situations in school — understanding is a necessary, or at least an extremely important, condition to the operation of re-enforcement

The law of belonging, set forth by Thorndike in 1931, affords a working basis for the study of the conditions of understanding [42] Belonging may be thought of as the seeing of relationship, the noting that this goes with that, follows from that, is caused by that, belongs with that or has something to do with

[42] E L Thorndike, *Human Learning* New York The Century Co, 1931

it When such relationships are perceived, effect-producing behavior follows and learning takes place quickly That is, adequate understanding leads immediately to behavior that satisfies the motivating conditions, together with effect (re-enforcement, confirming response, tension reduction), the *sine qua non* of learning

CONDITIONS OF PRACTICE IN LEARNING

There are several concepts necessary to any adequate treatment of learning McGeoch lists *association* or some equivalent term, such as *organization, connection, bond,* or *acquired relation,* as a necessary concept, when defined as follows "*Two or more psychological events will here be said to be associated when, as a function of prior individual experience, one elicits or stands for the other*"[43] Other necessary concepts listed by McGeoch are *motivation, discovery* (of appropriate responses), *fixation and elimination,* and *transfer*

Another necessary concept in learning is *practice* Practice is necessary in that it provides a circumstance for the operation of all the conditions of learning It is a necessary condition in the sense that learning does not take place without practice It is conceivable that learning may go on when the subject is not directly engaging in practice, either overtly or implicitly, in the phenomenon of reminiscence (Chapter XIV), but even here there must have been practice

In espousing practice as a necessary condition of learning it is recognized that practice is not a sufficient condition This is obvious from the palpable fact that an enormous amount of practice may be unattended by any measurable improvement in a function In fact practice may lead to deterioration in a function

There are conditions of practice that are necessary to learning, and conditions in which practice does not result in learning, at least in the sense of improvement in the function practiced There are other conditions that, while not essential, aid the process in varying degrees Motivation and effect are essential conditions, distributed practice is an economical condition, but

[43] *Op cit*, p 25

not a necessary one, "sheer repetition" is an ineffectual form of practice

Sheer repetition versus practice of the conditions of learning It is a notorious fact that vast amounts of practice, by one of the meanings of practice, may be indulged in without consequence so far as improvement in the function is concerned Indeed, deterioration may be a consequence It is the practice of the effective conditions of learning that counts Thorndike, whose connectionistic approach to psychology has been accused of foisting repetitive practice upon education, recognized this fact as early as 1913

> The law of habit is supposed to be that "practice makes perfect", or that the nervous system "grows to the modes in which it is exercised" But practice without zeal — with equal comfort at success and failure — does *not* make perfect When the law of effect is omitted — when habit-formation is reduced to the supposed effect of mere repetition — two results are almost certain By the resulting theory little in human behavior can be explained by the law of habit, and by the resulting practice, unproductive and extremely wasteful forms of drill are encouraged [44]

This conclusion is not incompatible with the empirical law of frequency It cannot be gainsaid that three repetitions of effective conditions of learning are more productive than two repetitions It is to be noted that the phrase *other things being equal* appeared in Thorndike's original statement of the law of frequency While attention was not specifically drawn to the ineptitude of frequency, *qua* frequency, until within the last 10 or 15 years, the idea is implicit in the associationistic writing of the last two or three hundred years Brown's law of *relative frequency*, put forward in 1820, is a valid generalization of empirical facts But it is to be noted that he recognized eight other laws of association, all of which are likewise recognized today The import of Meumann's well-known treatment of *the will to learn* is to the same purpose In commenting upon the fact that mere repetition of an act does not guarantee learning, Meumann says, "We profit from continued practice only in

[44] *Educational Psychology*, Vol 2, p 22 Reproduced by courtesy of E L Thorndike

proportion as we incite the will to progress and arouse an intention to improve [15]

We may now set down some of the more important conditions of which the efficacy of practice is a function These are all discussed more fully elsewhere in this text, and will not be elaborated upon here Perhaps the most pervasive of these is *motivation* It is fundamental to all other conditions As is seen presently in connection with the discussion of incidental learning, there is reason to believe that learning does not go on in total absence of motivation Motives define the problem and condition the re-enforcement mechanism Of course a wholly unmotivated learner would not practice, but the foregoing statement has a deeper significance than this It means that the nature of the motivation must have some degree of relevancy to the activity, or element in the total activity, to be learned As these lines are penned, the writer is motivated to write a book, but is wholly unmotivated to improve his hand writing – and in fact the last thousand words reflect a quality of penmanship quite as poor as the first thousand

In addition to motivation there is another closely related and probably inseparable condition, namely *effect* or *re-enforcement* And, at least, at all the so-called higher levels of learning, *belonging* is a necessary condition Contingent conditions are *variability* in performance Knowledge of results, and some observed relevance of the act and its consequences to the motivating conditions also deserve mention Learning, at the academic level, is intelligent activity

Variability in successive practices A certain attempt to provide a neurological explanation of learning has, on the whole, tended to emphasize an erroneous conception of the role of practice in learning The envisagement of learning, neurologically mediated, as the wearing down of synaptic resistances through repetition is father to the notion that exactly the same synapses are thus exercised on successive practices Critical observation of learning behavior, or even critical reflection, should have led to a different conclusion Were the

[15] E Meumann, *Psychology of Learning*, pp 360–361 New York D Appleton and Co , 1913

successive practices exact replicas of each other, a presupposition that seems to be required by a strict construction of this neurological theory, improvement in performance could not occur The *status quo* would be maintained, except for a tendency toward a greater degree of stereotypy Practice of any complex process results in improvement only if the learner on successive trials varies his performance As he tries one and then another procedure, he maintains a critical attitude, to the extent that the practice is intelligent He observes the consequences of his acts and selects those that are in the direction of the satisfaction of the motivating conditions and eliminates, or strives to eliminate, the others

It is legitimate to talk of frequency only in terms of the repetition of a total situation Only the end result is more or less constant Apropos is Angell's contention that only the functions of acts are stable In a maze, the rat gets to the same food-box, or executes the running of the same maze, on successive trials, but he accomplishes neither by the same identical motor action Even in the lowly rat we have a further demonstration of the ineffectualness of sheer frequency as a condition of learning and the error of the presupposition that repetition eventuates in learning by virtue of exercising a highly rigid neural pathway, as is seen in the somewhat sudden elimination of errors that may have been repeated an inordinate number of times

The thesis here defended is in accord with Dunlap's suggestion that a determinant of the effect of repetition is what may be called the set of the learner In connection with the defense of his *beta* hypothesis he calls attention to the fact that repetition not only may not increase the probability that the repeated response will occur again, but may in fact act to decrease it [46] In his own case he succeeded in eliminating the frequent error of typing *hte* for *the*, by practicing the sequence *hte* with the thought that the *hte* was an error which would not be made again Indeed the lad who is alleged to have been required

[46] K Dunlap, "A Revision of the Fundamental Law of Habit Formation," *Science*, 1928, Vol 67, pp 360–362 K Dunlap, *Habits Their Making and Unmaking* New York Liveright, 1932

to write "I have gone" a thousand times, and who, having done so, added a note to the effect together with the supplemental intelligence "and have went home," might have done better had he written "I have went," with the knowledge that it was wrong We cannot emphasize too strongly that the strength of habit does not rest merely upon the number of times it is repeated Erroneous repetitions made under the belief that they are correct — erroneous repetitions that are confirmed — do, of course, lead to erroneous learning, but when the error is perceived there need be no erroneous learning

Lability versus rigidity in behavior Just as the successive practices in an act of learning are not necessarily alike, so also may the successive performances of a learned act be unlike Again, it is only the function or the end accomplished which is stable Adaptability — variability, lability — is a general condition of learning and of the execution of learned acts This aspect of learning and of behavior is discussed further in Chapter XV

Incidental learning Incidental learning has two meanings in education and still a different meaning in psychology By the psychologist's use of the term, incidental learning is notoriously ineffectual By at least one of the educational usages, such learning stands as our best model of educational efficiency, and by the other usage it is certainly not ineffectual It should be observed therefore, if it is necessary to point to the moral in this instance, that in discussing the pro and con of incidental learning it is imperative that the sense in which it is being used be specified Incidental learning and teaching, as an educational practice, is not to be condemned by the psychologist's finding that incidental learning is ineffectual

As the psychologist uses the term, incidental learning is roughly synonymous with accidental learning It is assumed that no item is learned unless it be reacted to, unless its presentation is accompanied by a confirming reaction According to this conception a subject is "set" at least to some slight degree, or otherwise motivated, however evanescently, to "react to" when learning occurs Unnoticed sensory events make no contribution to our store of knowledge Incidental learning

is learning that takes place without instruction or experimentally induced incentive, and without any self-initiated, predetermined motive Essentially, it is fortuitous learning, though to be sure a person's bent, as determined by his habits of life and his prevailing state of mind, are influencing factors

A well-known experiment in incidental learning is that of Myers, wherein he dictated a list of words to some students who wrote them down ostensibly as a spelling exercise and compared the retention of the list with that of a comparable list dictated and written down, but as a learning exercise [47] An experiment by Jenkins provides another illustration of the meaning of incidental learning in psychology He formed a number of pairs of students, one member of which was to act as subject, the other, as experimenter, in a learning experiment The experimenter read aloud a list of words, the subject listened and tried to commit the list to memory The list was thus presented over and over until learned to a criterion The experimenter was thus set to read the words, the subject to listen and learn them Subsequently a test was made to ascertain how many words the experimenters had learned during the process of presentation, presentation without a formal set to learn [48]

In the laboratory a subject does incidental learning if he learns something of the fabrication of the apparatus, the furnishings of the room, or the habiliments of the experimenter, or other items to the learning of which he is not directed by the conditions of the experiment As noted previously, the learner's "prior habits of life" and "variable subjective condition" have a determining influence upon what is learned under such circumstances But in any event much of such learning is more or less accidental, and in general is quite undependable Without doubt, formal instruction would greatly increase the learning of the details of the experimental room

In education the terms *incidental learning* and *incidental*

[47] G C Myers, "A Study of Incidental Memory," *Archives of Psychology*, 1913, Vol 4, No 26

[48] J G Jenkins, "Instruction as a Factor in 'Incidental' Learning," *American Journal of Psychology*, 1933, Vol 45, pp 471–477

teaching are currently used to designate a particular method of organizing a course of study For example, in one school system there may be found at certain grade levels a formally organized course in language, in another system the teaching of language at this grade level may be made *incidental* to some other course of study This is incidental learning in a sense, and this usage of the term is, of course, legitimate, but it really has no parallel in psychological experimentation The teacher who gets good results with this method of teaching language does not leave the learning to chance, but makes very careful provision for it, both in the organization of the lessons and in the motivation of the pupils

A pupil may learn good language usage as a concomitance of reading good literature, of doing written work in biology, of participating in informal class discussion, or of theme writing in a course in English But, alas, he may go through all these procedures and yet learn very little about language usage, theoretical or practical, just as he may in a formally organized course in writing Similarly, a pupil may learn to spell in a formally organized course in spelling, or this learning may be made incidental to the work in some other course of study The experiments in psychology teach us that if the learning of language and spelling is left to the chance whim of the student, the result of such incidental teaching will be small indeed But we cannot by the same token condemn purposeful, forthright incidental teaching as it is practiced in school

Knowledge of the ineffectiveness of incidental learning, if it is really incidental, is of the greatest consequence in education The reading of classical literature may lead to improvement in English usage, and it may not There is the expectation that it will do so if there exists on the part of the pupil what may roughly be called "language consciousness," if he is interested in improving his own language, or reacts to good language as good language, or reacts to certain elements as correct and worthy of imitation and, especially, contrasts them with his own usage That is to say, there must be a *confirming reaction* — without which the reading of good writing no more improves language usage than does the writing of themes improve hand-

writing Learning is an active process, it is also a specific one. One learns in a total situation what he reacts to As has been said, one learns by practice what one practices

There is a third field of learning to which the term *incidental* applies, namely the interlearning that goes on between the members of primary groups The informal learning that goes on in the home, on the playground, among neighborhood groups and other primary groups, or between individuals in social situations, is perhaps our best example of educational efficiency The socialized recitation has some of the characteristics of this kind of learning, and instances of it are to be found wherever pupils get together in give-and-take situations In a sense the learning that goes on here is incidental, in the sense that there exists neither the purpose to teach nor formal intention to learn At first thought the admitted efficiency of this learning may seem to contradict the statements made about incidental learning in the foregoing paragraphs There is, however, one important psychological distinction between the conditions of incidental learning in primary groups and incidental learning in the instances referred to there While there is no specific intention to learn in the face-to-face situations of the primary group, the activities are highly motivated The situations and responses relate to aspects of a pupil's life that to him are highly important Here conditions are ideal for the operation of effect or re-enforcement Confirming responses are almost certain to follow

This chapter makes no plea for any particular method of organizing courses of study The advocates of incidental teaching of language, spelling, and arithmetic, maintain that it provides favorable conditions of motivation in that instruction in these skills is provided as the need of it arises It is also claimed that the instruction is given in the specific connection in which it is to be used Both these matters are important Presumably it should be possible to provide similar conditions in formally organized courses of study

The question of drill As the writer understands the use of the term *drill* it refers to something akin to repetitive practice, as in spelling and arithmetic computation, in which the

successive practices, if correctly executed, are more or less alike This construction is not insisted upon, because it is probably not particularly inappropriate to speak of drill in handwriting or in Beethoven's Fifth Symphony, in which the intent is to achieve a better performance each trial rather than to fix a given performance As the term is customarily used, drill makes the nearest approximation of any form of practice to repetitiveness Here the law of frequency has the same application and is subject to the same qualifications as elsewhere in learning *Drill as an educational procedure is not abrogated by the denial of any efficacy to frequency qua frequency* If sheer repetition has no efficacy, repetition of the effective conditions of learning does have, and the status of drill is unaffected by the denial

In certain current educational writing associationism, connectionism, and stimulus-response as employed in American psychology are accused of having foisted upon education excessive and unwarranted dependence upon drill work Such writing may best be described as "boondoggling" In the first place such teaching is not implicated in American psychology, in the second place there is not generally any undue reliance upon drill in American education by those who have had any virtuous training in psychology Not within this century have educational theorists advocated drill as the principal method of educating the youth It would, of course, be surprising if teachers in considerable number have not made excessive use of drill, but, if so, this has been their own idea They have not got this practice from their methods instructor or educational psychology teacher

The last half-century, which marks roughly the period of most rapid growth of psychology, has seen less formal drill than any like period in the history of American education The plethora of good books available for educational purposes has served to reduce emphasis upon drill In fact *formalism,* the embodiment of drill, was ushered out of education, in large measure by the Herbartians and G Stanley Hall, in advance of the rise of connectionism and stimulus-response psychology These elements in psychology are also accused of having led

our schools to develop a generation that cannot think Under the baneful influence of this psychology, teachers are alleged to have occupied themselves with the inculcation of stimulus-response connections, connections between questions and answers, with the result that the pupil when he grows up can respond only by giving the pat answer he was taught to give in school

One could doubtless find such practices today, did he look long enough, for there are about a million teachers But he would find them not among teachers steeped in psychology and educational method, but among those who have least acquaintance with them From the tenor of these criticisms one would get the impression, did he not know better, that the *project method,* the *activity school,* the *unit plan,* the *contract plan,* and the *Winnetka* and the *Dalton systems* are to be found only in textbooks

Needless to say, drill, mere verbalistic practice, should never be substituted for logical, relational, ratiocinative, insightful learning, when the material of learning is capable of such treatment There is, however, much in the mental equipment of an educated person which does not yield to such learning English spelling, the names of most objects, the typewriter, and number names are examples Moreover, meaningful material is also learned by practice although drill is not the best means of implementing the practice of such materials

Finally, it should be said that there are both desirable and undesirable uses of drill in school Drill readily becomes monotonous Excessive and unnecessary written work should be avoided The need, yea the felt need, of drill should be demonstrated Above all, it should be spirited Since, as we have seen, there is no virtue in sheer repetition, care should be taken to see that the circumstances are favorable for the operation of the effective conditions of learning Those that are most generally applicable to the drill situation are motivation and immediate, accurate knowledge of results Drill is especially likely to become spiritless when pupils are asked to practice materials much of which they have already mastered It is at its best when pupils are engaged individually in practice at the

point of error The useful scope of drill as an educational procedure is strictly limited

SOME APPLICATIONS TO SOCIAL LEARNING

The principles of learning, as set forth in the foregoing, may be applied to the whole range of human behavior – emotional adjustment, traits of personality, academic learning, conditioned reflexes, reasoning, social behavior, and so on Since the earlier chapters have emphasized the role of the cultural heritage in mental development we may, as a partial step in tying together the psychological principles of learning and the social conditions of learning, illustrate their operation of social learning, particularly imitation [49]

The individual starts life in modern society in a tremendously complex culture that poses hundreds of problems and contains the solutions, often various solutions, of each Perhaps it is well that the beginner does not perceive clearly their number and complexity, otherwise he should surely be bewildered and baffled He learns to sit, walk, eat, and talk as those about him do This is but the merest beginning He finds that thousands of situations call for responses more or less specific to each There are occasions when it is honorable to fight and others in which it is a disgrace, occasions when one may disagree with impunity and others when it is socially expedient to conform There are highly intricate social customs to be learned, and social attitudes, beliefs, moral values, and knowledge and skills almost without end The immature members of a group become like the mature members by learning the ways of the group In this way culture is transmitted, and in this way individuals are educated

One of the important methods by which individuals learn the ways of a group is that of imitating its members In other words, social imitation is one of the great methods of education In the first place imitation is presumed to be a form of learned behavior The tendency to imitate is acquired and in most

[49] The following discussion is based chiefly upon the work of N E Miller and J Dollard, as presented in their *Social Learning and Imitation* New Haven Yale University Press, 1941.

instances the act of imitation requires a good deal of previous learning A child must have acquired considerable mastery over the elemental sounds of speech before he can imitate the speech sounds of another Certainly one would have to know a good deal about painting before he could imitate the style of an artist The acquisition of the generalized tendency to imitate is explainable by the laws of learning, as set forth in this chapter In the second place imitative learning is explainable by these same laws

As previously noted, all learning presupposes a motive or drive Some motives like hunger and thirst are innate, others like pride and ambition are acquired, by laws of learning The motive evokes a response – before learning is completed, multiple response The response that is rewarded – that satisfies the motivating conditions – becomes dominant, by virtue of the reward (re-enforcement, confirmation, or effect), with the result that that response becomes connected with the cue stimulus

Now it happens that motivated children often take their cues from the behavior of adults, as in matching or copying, and are subsequently rewarded in various ways for doing so There is the reward induced by the satisfaction of the motivating conditions, and frequently additional reward in the form of approval is provided by the adult Thus children are rewarded for imitating adults (and other older and wiser persons) Children also learn to imitate other children for the same reason and with the same result

It is quite natural then, from the laws of transfer, that by reason of these rewards children should acquire a somewhat generalized tendency to imitate By the same principles of *motivation, response* to cues, and *effect* children acquire a hierarchical arrangement of values in the sense of learning whom to imitate Imitation is by no means confined to the behavior of children As Miller and Dollard point out, adults who are less adept in perceiving the social significance of stimulus cues imitate wiser or socially more astute members of society This form of imitation may be observed even in the halls of Congress, and for the same reason, namely that less experienced or politically less competent members are rewarded by reelec-

tion and by patronage for following the leaders These authors also call attention to the utilization of imitation by people who seek to move to a higher social stratum It is by thus responding to social situations as do persons in the class to which they aspire that they acquire the habits appropriate to that class No doubt the immigrant utilizes the same mechanism with forthright purpose He, as the child, has the added burden of learning whose behavior to imitate and in what situations

There are good and bad models in our society One learns by the nature of the social consequences that some leaders are better models than others He is rewarded for following some and punished (by disapproval or otherwise) for following others Miller and Dollard emphasize the hierarchization or grading in the following classes of leaders age, social status, intelligence, and technical skill How easy it is for the youth possessing great athletic prowess to become a leader!

In the school, as in the state, that which counts most is the quality of leadership There are certain ill-defined qualities of leadership, in children and adults, which attract others, whether for good or ill Perhaps in our schools we could well afford to give considerable attention to the selection and training of leaders even at the expense, if need be, of attention to minor infractions of the social code

Desirable and undesirable forms of behavior differ not in the psychological principles by which they are learned, but in their social consequences Naturally the whole problem of discipline cannot be solved by providing better leaders The foregoing is a suggestion as to the bearing imitation seems to have on the problem

APPLICATION TO MEANINGFUL LEARNING

Any complete body of learning theory must be able to account for all the observable phenomena of learning One of the most obvious facts of learning is that learnableness of material varies with its meaningfulness to the learner — a fact which some critics aver is not explained by traditional associationistic psychology This fact has been so obvious that the psychologist has scarcely bothered to consider it In fact, he

has rather regarded meaningfulness and learnableness as the same thing

As is indicated in Chapter XIII meaningful material is already partially learned A point emphasized in Chapter IV and alluded to in various other chapters is that teaching and learning, to be of full significance, should be predicated upon the past experience of the learner The learning task should be relevant to his background It is taken for granted that these conditions make for efficient learning as compared with the laboriousness of mere verbalistic learning When a learner is confronted with a task to which his past experience is relevant the conditions are favorable for the operation of transfer The generalized perceptions and responses acquired in the past transfer because they are generalized Indeed this is what makes his past experience relevant He is better able to analyze the situation, his perception of the cues is more dependable, his awareness of belonging is keener, and by reason of his acquaintance with similar problems (similarity is a prime condition of transfer) the correct response occupies a more dominant position in the hierarchy of responses It is also likely that the reenforcement mechanism is induced with greater certainty because of a keener sense of belonging

EDUCATION AND SYSTEMS OF PSYCHOLOGY

We cannot here enter into a discussion of the tenets of the various systems of psychology For such a discussion the student is referred to two critical treatments of these systems, Woodworth's [50] and Heidbreder's,[51] and to various articles published by the proponents, notably those here cited by Titchener,[52] Angell,[53], and Watson [54] The student or teacher of

[50] R S Woodworth, *Contemporary Schools of Psychology* New York The Ronald Press Co , 1931

[51] E Heidbreder, *Seven Psychologies* New York D Appleton-Century Co , 1933

[52] E B Titchener, "The Postulates of a Structural Psychology," *The Philosophical Review*, 1898, Vol 7, pp 449–465

[53] J R Angell, "The Province of Functional Psychology," *Psychological Review*, 1907, Vol 14, pp 61–91

[54] J B Watson, "Psychology as the Behaviorist Views It," *Psychological Review*, 1913, Vol 20, pp 158–177

professional educator who has an urge to make some educational pronouncement in the name of one or another of the systems should make sure that his claim is really indicated before giving expression to it

The first of the systems to emerge was *structuralism,* headed by Titchener This event took place around the turn of the century Psychology was then getting a fair start Structuralism was an attempt to mark out the field — subject matter and method — of scientific psychology This attempt was further stimulated by the prosperity of another approach in psychology which Titchener named *functionalism* Thus, while the functionalistic approach had existed prior to the advent of structuralism, it tended to crystallize into something of a system as a result of Titchener's attacks upon it

The structuralists took their field to be the analysis and description of the states (structures) of consciousness Their experimental method was introspection Functionalism, under the influence of Angell, Dewey, and Carr, incorporated the structuralists' program, but went beyond to concern itself with the function of conscious states It maintained that sensation, feeling, and thought not only have structure, observable by introspection, but also a role to play — a function — in the adaptive life of the organism Functionalism made use of introspection and of the objective method of experimentation

Behaviorism began about 1912 as a revolt against functionalism — as Watson's revolt against the use of introspection, although McDougall had "revolted" as early as 1905 For the behaviorists psychology became the study of behavior

Gestalt psychology is coeval with behaviorism, although, because of the fact that it made its appearance in America several years after the advent of behaviorism, it is sometimes thought of as being of more recent origin Its birthplace is Germany, and its founder, Max Wertheimer W Kohler and K Koffka have been its best known advocates Offshoots of this system are *organismic psychology,* associated particularly with R H Wheeler, and *topological psychology,* associated with K Lewin

The erstwhile systems of structuralism, functionalism, and behaviorism have been absorbed, and, as active systems, have

disappeared in the sense that they are not now being actively put forward This is also true of other minor systems, *purposivism*, advocated by McDougall, and *dynamic psychology*, associated with Woodworth Thus Gestalt psychology, and its companions in faith, is the only system that is active today

Gestalt psychology grew out of Wertheimer's observations on apparent movement (Chapter IV) The reader will recall that action, apparent movement, is seen when still pictures or forms are presented in certain temporal and spatial relationships, yielding something more than the sum of the parts Hence the now oft-repeated dictum *the whole is more than the sum of its parts* This system of psychology has made its greatest contribution in the field of perception It has also done well to emphasize the role of perception in learning It has had a good deal to say about insightful learning, although its actual contribution to the understanding of such learning has been negligible Indeed its contribution to the field of learning has not been great, relatively [55] The direct influence of the systems of psychology upon education and educational psychology is negligible Methods, philosophies, and problems that have actually been deduced from the systems as systems or actually have been imposed on education and educational psychology by systematic necessity are few indeed However, some of the indirect influences — the research and theoretical contributions of psychologists — were brought about by the influence of the schools to which the psychologists belonged Some of the fundamental problems in psychology have been created by the systematic position of the psychologists The experimental methods employed have also been determined in part by systematic position, although within the last two or three decades systems of psychology have not generally been distinguishable by methodology

Carr, Woodworth, and Thorndike have had a great deal to do with the systematic development of learning Carr has held the functional point of view, Woodworth, the dynamic, and

[55] *Cf* G W Hartmann, "Insight *Versus* Trial-and-Error in the Solution of Problems," *American Journal of Psychology*, 1933, Vol 45, pp 663–677

Thorndike has been styled a connectionist Of the contributions of psychology to education, second only to learning is mental measurement Binet, the greatest figure of all in this field, did his work before most of the systems had crystallized The work of Terman and Kuhlmann does not appear to have been greatly influenced by systematic positions in psychology Both are graduates of Clark University and were students of Hall Another important movement in education has emphasized the importance of social institutions and the cultural heritage upon behavior and upon the development of the higher mental processes The leader in this movement, Judd, has been numbered among the functionalists He was brought to this point of view, however, not by functional psychology but rather by the influence of Wundt, the forefather of structuralism

Without doubt Herbart, Dewey, Judd, and Thorndike are the psychologists who have exerted the greatest influence upon education Hall and Watson, in their work upon child development, must be given a prominent position Herbart antedated the schools of psychology Dewey and Judd have maintained functionalistic leanings, and Thorndike, as noted previously, is currently regarded as a connectionist Watson is a behaviorist In so far as the writer knows, Hall did not commit himself, although he could well be claimed by the functionalists

We may see something of behavioristic procedure in Watson's treatment of thought as integrated bodily activity — thought as language activity or its equivalent The reduction of thought to bodily activity, like swimming or playing tennis, serves to make it less a mystery Reduction of the higher to the lower, the complex to the simple, extends our knowledge and need not and does not affect the function of the higher and the complex

> Does this view rob us of anything in science, literature or art? Surely the putting of thought back upon reasonable and investigable grounds robs us of nothing Because the maiden thinks of her lover in words rather than in terms of some mysterious process, does she become any less adorable to her lover, or does the subject of love in literature and art become degraded because we have to admit it?

Do the beautiful thoughts of the idealist for mankind as a whole or of the mother for her child become less beautiful, less worthy themes of discourse in literature and art, because psychologists now state that those thoughts are couched in words or their equivalent? It is rather curious that explicit bodily acts of justice, mercy, kindness, and sympathy have no stigma attached to them because they are bodily acts, yet many scientists balk at admitting that thoughts of justice, mercy, and sympathy belong to the same category [56]

Few psychologists have talked more intelligently about integrated behavior than has Watson In fact there is nothing incompatible between a mechanistic approach to psychology, as that advocated by Watson, and the education of "the whole child" Watson's mechanistic schema was certainly an integrated one

Thorndike's general approach to psychology has resembled Watson's in one important respect, namely that he too has sought to investigate basic conditions Despite the obviousness of understanding as a factor in learning theorists have had surprisingly little to say about it Perhaps the reason for this is not so much the undervaluation of its importance as it is that it has not been regarded as basic or as having any ultimate explanatory value To be sure a student could read a wagonload of books and journals written by whole schools of theorists without getting the impression that understanding is importantly implicated in the learning process Even so, it is highly probable that these same theorists would contend that little learning goes on or is possible, at the academic level, without understanding They have addressed themselves to the task of ascertaining the basic operations of learning — those operations by which we learn when we understand as well as those by which we learn when we do not Selection and elimination when made purposely require explanation just as they do when made according to some other principle Conceivably, understanding derives much of its efficacy in learning from the fact that it provides ideal conditions for the operation of the reenforcement mechanism, as already noted

[56] J B Watson, *Psychology from the Standpoint of a Behaviorist*, p 325 Philadelphia J B Lippincott Co , 1919 Reproduced by courtesy of the publishers

The teacher and the theorist are working at different jobs The teacher tries to effectuate a level of understanding to the end that the conditions thereof may be made a means of learning The theorist has taken it for granted that this is what the teacher should do His business is to supply a theoretical explanation of how learning, by understanding or otherwise, takes place

Teachers and professors of education have been rightfully concerned about the pupil's appreciation of the importance of the learning in which he engages "Therefore, progressive effort is to find ways to build deep concern for necessary learnings The progressive thesis is that things worth learning are things worth being concerned about" [57] The import of this quotation is consonant with the psychology of motivation from every approach known to the writer, and may be said, fairly, to represent the consensus of opinion of psychologists and teachers the world over Indeed it is grist in Thorndike's mill, which, like the mills of God, grinds exceeding small The statements are covered wholly and completely by the law of effect, and the principle is operative because of the law of effect The fact that they can be reduced in their operation to this law does not in the least lessen their value to the teacher when thus couched in attractive and useful terms Thorndike would find no quarrel with these statements as an educational thesis In fact he could endorse them wholeheartedly, because it is precisely under such a condition that effect operates As a psychologist he wishes to know the fundamental condition that makes this obviously wise educational principle work

American psychology is more indifferent today than at any time in its history to *systems* as systems It is eclectic with respect to them Education can afford to be no less so In learning, one of the principal forts of educational psychology, all of the schools with the possible exception of structuralism, have made some important contributions The problems of education, general and particular, have been the foci of research in educational psychology These have for the most part grown

[57] A V Kelliher, "Progressive Education," p 862, in *Encyclopedia of Educational Research* New York The Macmillan Co, 1941

out of problems of education rather than out of systems of psychology A change in systematic allegiance does not change materially the character of the educational problems, although it may alter the way we view them

Certain educational theorists complain of the neglect of meaning in the writings of the connectionists, behaviorists, and other associationists Associationism is not hostile to meaning James did not find the subject awkward to handle, nor have Woodworth, Calkins, Dunlap, Pillsbury, Washburn, McDougall, nor have the functionalists, Carr and Dewey, been embarrassed by it These psychologists have not only recognized meaning as a legitimate datum of psychology, but have also done the most significant writing about it It is difficult to find a more engaging account of meaning than that set forth in the Herbartian psychology of the last century One of the best treatments of meaning in modern educational writings is found in Horn's discussion of instruction in the social studies [58] It must be said, however, that Gestalt psychologists have made the present generation more conscious of meaning

These educational theorists have misrepresented American psychology They have represented isolated instances as typical instances Connectionism and behaviorism are accused of having caused education to forget personality "Personality and its enrichment were forgotten Reduction of higher to lower — atomism — had got in its work" [59]

As a matter of fact, no single system, except psychoanalysis, has contributed so much to the awakening of interest in personality as has behaviorism The teacher's concern about the "whole child" has probably been influenced more by behaviorism than by any other system It is not an exaggeration to say that our schools have, during the reign of American psychology, devoted more attention per pupil hour to the development of personality than they have in any similar period in their history

[58] E Horn, *Methods of Instruction in the Social Studies*, Chapter IV New York Charles Scribner s Sons, 1937

[59] W H Kilpatrick, *Democracy and the Curriculum*, p 347 New York D Appleton-Century Co , 1940 (H Rugg, ed)

We should educate the "whole child" because an educational program that looks after the training of every educable aspect of the child's development produces a better child The fact that the whole is greater than the sum of its parts, that the meaning of the parts is derived from the whole, that an embryonic salamander makes whole movements before it can make part movements, does not make the business of educating the whole child any more urgent Things that pass by the same name are not necessarily the same, as is well illustrated by Irvin Cobb's observation that laying brick has little correspondence to laying an egg

CHAPTER XII

CONDITIONS OF LEARNING INDIVIDUAL DIFFERENCES

ON THE APPLICATION OF PSYCHOLOGY TO EDUCATION

It is repeatedly emphasized in psychology that all the facts of learning are relative to the conditions under which they have been observed This situation imposes certain special obligations upon the educational psychologist

He is privileged to make important contributions to general knowledge of learning by testing in a lifelike laboratory, the classroom, the generality of the findings of the psychological laboratory and by determining the conditions under which a given law or principle of learning holds and the conditions under which its attempted utilization by the teacher may be expected to bring the returns anticipated for it In this respect, he faces toward general psychology and in this capacity he is justifying the second term in his title The educational psychologist has a certain obligation to education which, if discharged, justifies the first term in his title By his being familiar with general psychology and with classroom conditions, he is expected to acquaint the teacher with the facts of learning and to give advice concerning effective teaching and learning situations This one of his duties is not to be regarded as faithfully discharged when he merely speculates about such matters or makes the best inference he can in the light of his knowledge of psychology and education It is his business to test his deductions and tentative recommendations under conditions that teachers may normally be expected to follow, realizing, of course, that his experiments conducted under normal school conditions lack the nicety of those executed under more rigid laboratory conditions But if the educational psychologist by reason of the poorly controlled conditions of the classroom is unable to demonstrate a favorable balance with respect to the

operation of a given psychological precept, it is futile to expect the typical teacher to turn it to good account

Educators have been patient and long-suffering They have rather diligently followed the results of the psychological laboratory and have been tolerant of the speculations and deductions of psychologists, even though these are often made by persons who have no real insight into the problems and conditions of learning in school

More than a half-century of research has yielded literally thousands of experiments in learning While the harvest is not phenomenal, it must be admitted that we are in possession of quite a fund of knowledge respecting the conditions of learning There are indeed a considerable number of experiments on learning in school situations, really a surprising number when one attempts to assemble them However, in a great many instances these experiments have been planned without reference to the established facts of learning as discovered by the use of the memory drum and other apparatus of the psychological laboratory There is urgent need of knowledge of the generality of these facts of the laboratory and of the conditions under which they apply In this the educational psychologist has his work cut out In the chapters that follow an attempt is made to effect such synthesis between laboratory and classroom experiments as the facts now seem to warrant

The educator entertains a noteworthy skepticism relative to laboratory experiments in learning This is a wholesome attitude, especially if prompted by a true appraisal of the situation The most serious barrier to the full application of the experimental data to education is not that the psychologist uses rats as subjects in his experiments, or engages his human subjects in the learning of stylus mazes and nonsense syllables, though that objection is real enough from the educator's point of view The real ground for skepticism is the fact that the conditions between learning in the laboratory and in school are, in so many ways, dissimilar Lack of equivalence in conditions in learning, as between the laboratory and school, constitutes a more serious limitation to practical application than does lack of equivalence of the learning material as such

There are three reasons, chiefly, why the findings of the laboratory may fail to find useful application in the classroom first, laboratory findings may, in some instances, lack sufficient validity or generality to warrant their application in school, second, the situation in which application is attempted may be so foreign to the conditions under which the findings were obtained as to make them inoperative, and, third, teachers may lack skill in applying the findings

To anticipate a point discussed at some length in the ensuing chapter, it is pointed out here that teachers are sometimes impatient of small increments in teaching and learning efficiency To be sure they are often led to expect big things from psychologists, educational theorists, and convention speakers Good teaching is difficult The simplest psychological principles are difficult to apply, and some perchance, even some of those that aid our understanding very much, have little or no known application to teaching and learning efficiency In all cases demonstrable differences in favor of the application of a principle are likely to be small and, in comparison with the hope that is sometimes held out, discouraging The most hopeful element in it all is the fact that small differences may be exceedingly important in the long run

EXTENT OF INDIVIDUAL DIFFERENCES

Differences among individuals are obvious facts of nature For example, in a sampling of 750 college (freshmen) men, Thurstone obtained a mean weight of 138 6 pounds, and an *S D* of 15 7 [1] Reference to a table of areas of the probability surface enables us to calculate the percentage of men in the sample who fall above or below any given value Approximately 16 per cent equal or exceed 154 3 (138 6 + 15 7), and 2 3 per cent, 170 0 (138 6 + 31 4) Similarly, 16 per cent do not exceed 122 9 pounds, and 2 3 per cent do not exceed 107 2 Thus about 68 per cent fall between 122 9 and 154 3, and 95 4 per cent, between 107 2 and 170 0 These values assume a normal distribution of weight scores

[1] L L Thurstone, *The Fundamentals of Statistics*, p 202 New York The Macmillan Co , 1925

In studying individual differences in a mental function, such as test intelligence or achievement in a school subject, we encounter certain difficulties not met in studying individual differences in height or weight In the latter we have a known zero point and equal units of measurement, that is, we apply a metrical scale In mental measurement we have only a *quasi* scale While we use numbers, we may subject them to mathematical treatment only with certain reservations We cannot legitimately say that one pupil is 25 per cent more intelligent than another or that he learned 25 per cent more than another, while differences in height or weight can be expressed in percentage

Differences in scholastic achievement One method of expressing differences among pupils in a given grade is in per cent whose achievement deviates from the modal achievement by one or more grades This is known as the method of grade-overlapping Ayres suggested the use of this method in 1909 [2] In 1918 Kruse published the results of an extensive investigation of grade-overlapping in achievement in the elementary school [3] Between the dates 1908 and 1918 quite a body of similar data appeared, much of it as an incidental result of the standardization of achievement tests [4] Work on this topic, which went forward rather vigorously for a decade following the appearance of Ayres's book, began to fall off in the early

[2] L P Ayres, *Laggards in Our Schools* New York Russell Sage Foundation, 1909

[3] P J Kruse, The Overlapping of Attainments in Certain Sixth, Seventh, and Eighth Grades" *Teachers College, Columbia University, Contributions to Education*, No 92, 1918

[4] B R Buckingham, "Spelling Ability, Its Measurement and Distribution," *Teachers College, Columbia University, Contributions to Education*, No 59, 1913 C H Elliott, "Variation in the Achievements of Pupils," *Teachers College, Columbia University, Contributions to Education*, No 72, 1914 D Starch, "The Measurement of Efficiency in Reading," *Journal of Educational Psychology*, 1915, Vol 6, pp 1–24 D Starch, "The Measurement of Efficiency in Spelling, and the Overlapping of Grades in Combined Measurements of Reading, Writing, and Spelling," *Journal of Educational Psychology*, 1915, Vol 6, pp 167–186 W S Gray, "Studies of Elementary School Reading through Standardized Tests," *Supplementary Educational Monographs*, No 1 University of Chicago Press, 1917

twenties Cornell's investigation published in 1937 is among the few recent ones [5]

A fair appraisal of the various investigations places the number of pupils in the various school subjects who equal or exceed the modal achievement of the next grade above at almost a third The percentage that falls at or below the modal achievement of the next grade below is only slightly less About 10 per cent deviate from the mode by as much as two full grades above and two full grades below, and 2 or 3 per cent, by as much as three grades In Cornell's data the grade range, in achievement, of 7-year-old pupils is 1 to 6, the middle 80 per cent spreading over one and a half grades Her 10-year-old pupils ranged from standard second- to standard ninth-grade achievement, the middle 80 per cent spreading over three full grades

It is reasonable to suppose that the amount of grade-overlapping increases from grade to grade throughout the elementary school Cornell's results show this to be the case This increase is probably more pronounced now than formerly, in view of the growing tendency to maintain homogeneous age groups and the consequent reduction in extra promotion and failure With homogeneous age groups, differences in mental age necessarily increase with age We may also infer that the amount of grade-overlapping increases from grade to grade from another fact, discussed presently, namely that equal amounts of practice, and doubtless equal amounts of schooling, tend to increase individual differences [6]

[5] E L Cornell, "The Variability of Children of Different Ages and Its Relation to School Classification and Grouping," *Educational Research Studies,* No 1 University of the State of New York, 1937

[6] *Cf* A R Gilliland and E L Clark, *Psychology of Individual Differences* New York Prentice-Hall, 1939 D D Durrell, "Individual Differences and Language Learning Objectives," *Childhood Education,* 1936, Vol 12, pp 149–151 F S Freeman, *Individual Differences* New York Henry Holt and Co , 1934 M E Irwin, "Motivation, Emotional Responses, Maturation, Intelligence, and Individual Differences," *Review of Educational Research,* 1936, Vol 6, pp 300–309 W C Trow, "Motivation, Emotional Responses, Maturation, Intelligence, and Individual Differences," *Review of Educational Research,* 1939, Vol 9, pp 285–294

Ability or practice The time-honored virtues toil, persistence and patience pay dividends in school as they do elsewhere But in few spheres do we have such cause to see how circumscribed these virtues are Praise of these habits of study should be strictly qualified with the phrase *other things being equal* In school those who plod excel those of equal ability who adopt the method of the hare But alas in the classroom it is likely to be the hare, not the tortoise, which wins the race Of course this does not hold when ability is held constant, but in a typical student population ability is not constant There simply are not enough hours in a day to enable the slow learner, even if he utilized all of them, to equal the "swift dash" of the able student

In a certain investigation a group of eighth grade pupils was engaged in studying a specially prepared selection of material in the social science field After a single reading by all members of the group a carefully prepared multiple-choice test was administered in order to assess the learning The mean score of the highest and lowest 25 per cent was computed, subsequently an attempt was made to determine the number of additional readings the lowest 25 per cent would require in order to attain the average score achieved by the former in one reading The test was readministered after each reading, the ordinal position of the responses being changed each trial The students who placed in the lowest fourth after the initial reading did not quite equal in three additional readings and testings the mean score achieved by the highest fourth after the initial single reading [7]

In another investigation groups of college students, Juniors and Seniors, listened to a phonographic presentation of a specially prepared lecture "The Story of Florence" Following the presentation the students took a 70-item completion test, principally factual, covering the material of the lecture All students listened thereafter to two additional presentations of the lecture and reacted to the test items after each presentation, the form of the test being unchanged The students realized they

[7] T N McClelland, "Overlearning and Review," *Master's Thesis* State University of Iowa, 1940

were participating in an experiment, the object of which was to master as much of the content as possible Co-operation appeared to be good

The results per average for the highest and lowest 10 per cent and for the highest and lowest 20 per cent on all three trials are presented in Figure 9 It is clear that so far as the learning

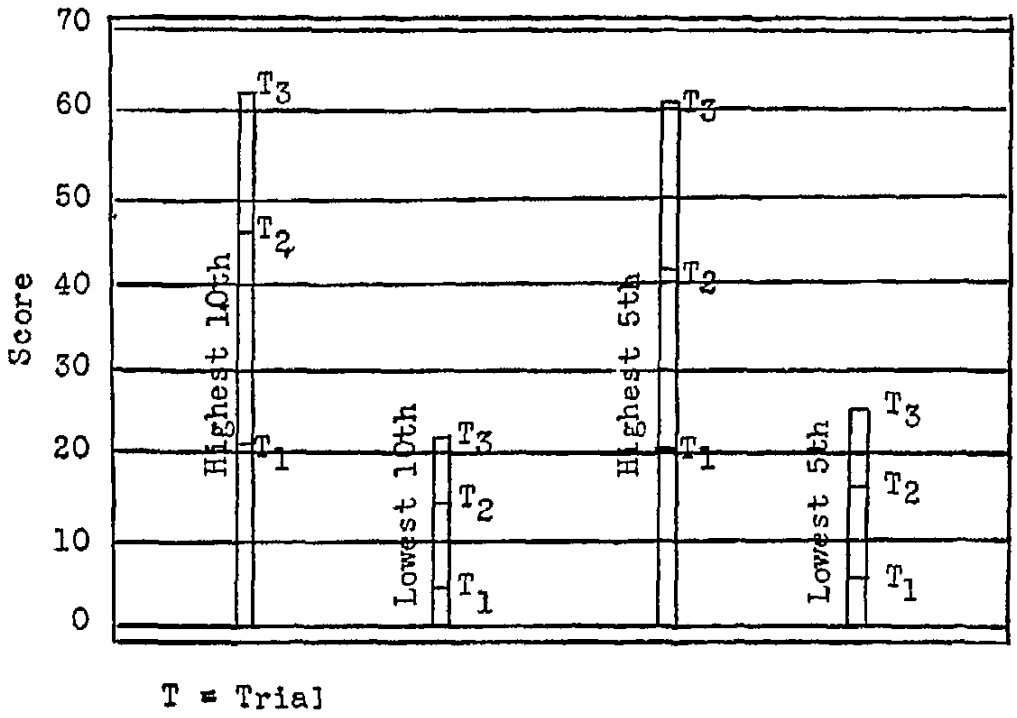


FIG 9 EFFECT OF PRACTICE UPON INDIVIDUAL DIFFERENCES

of specific data is concerned the lowest 10 per cent of this fairly select group of students did no better in three trials than did the highest 10 per cent in one This is all the more striking in view of the fact that after the first presentation the students had some knowledge of the information called for in the test The results for the highest and lowest fifths are only a little less striking All such findings are, of course, relative to the task One could set tasks so difficult that only the best students could ever succeed, and tasks so easy that there would be little difference between the best and poorest students [8]

[8] S J Williamson, 'Retroactive Inhibition as a Function of Similarity in Meaning between Primary and Interpolated Material," *Master's Thesis* State University of Iowa, 1942

Effect of practice on individual differences The effect upon individual differences of equal amounts of practice has provoked considerable interest since its investigation by Thorndike in 1908 Do equal amounts of practice increase or decrease differences between good and poor performers, or maintain the *status quo*?[9] The results have been envisaged as a means of investigating the nature-nurture problem with respect to various abilities Some authorities have maintained that if excellence in an activity, for example arithmetic, is largely dependent upon training and very little dependent upon innate capacity, equal amounts of practice should operate to make individuals more alike This interpretation is reflected in the statement by Thorndike and Hahn that since "equalizing opportunity does not seem to equalize achievement nature, not nurture, seems to be the chief cause of the differences in ability"[10]

Perhaps equal amounts of practice would tend to increase individual differences in all tasks that are closely correlated with intelligence or any other innate capacity The effect of practice on individual differences has also seemed to certain writers to be significant for education in a democratic state and for selection in education[11]

From the beginning, the question of method has been troublesome More than a half-dozen different methods have been employed in the fifty or more experimental attempts to assess the effect of practice on individual differences Different methods may easily give somewhat different results, even if they are all good, but if a problem is well rationalized and the methods well conceived, two such methods cannot give diametrically opposed results Such an outcome is *prima facie* evidence that at least one of them is not good

[9] E L Thorndike, "The Effect of Practice in the Case of a Purely Intellectual Function," *American Journal of Psychology*, 1908, Vol 19, pp 374–384

[10] H H Hahn and E L Thorndike, "Some Results of Practice in Addition under School Conditions," *Journal of Educational Psychology*, 1914, Vol 5, pp 65–84

[11] H B Reed, "The Influence of Training on Changes in Variability in Achievement," *Psychological Monographs*, 1931, Vol 41, Whole No 185 This article gives a good review of the literature

In connection with the present problem two graphical methods have been used, which give opposite results, and two groups of statistical methods, which likewise give opposite results Inasmuch as there has been considerable divergence of opinion among psychologists as to the legitimacy of the various methods we shall examine them with some care With the graphical method the performances, on successive practices, of the initially good and the initially poor have been plotted by the time-limit and by the amount-limit method In the former, time is kept constant, is limited, and amount varies, curves plotted from such data show achievement per constant unit of time With the latter method, the curve shows the time required to do successively equal amounts of work For purposes of the problem at hand these two methods are not interchangeable, as they might at first appear The former, as a rule, shows diverging curves, the latter invariably yields converging ones, as Wells observed in 1912 [12] The two procedures have been used equally often, and equally often the experimenters have come to different conclusions about the effect of practice on individual differences [13] Obviously, they are not equally good The converging curves obtained with the amount-limit method appear to be mathematical artifacts If *A* does 5 units of work in the first 5-minute practice period, for example, and 10 units in the last 5-minute practice period, and if *B* does 20 and 30 units in the same two intervals, it is obvious that there is more difference between them after practice than before, if the units are equal They were 15 units apart on the first practice, and 20 units apart on the last If curves are plotted in terms of amount per 5-minute interval, they will diverge, if plotted in terms of time per unit, they will converge, necessarily for *B* reduces his time per unit of work from 15 seconds to 10 seconds, *A*, from 60 to 30

A difficulty of the same sort is met in the statistical methods

[12] F L Wells, "The Relation of Practice to Individual Differences," *American Journal of Psychology*, 1912, Vol 23, pp 75–88

[13] E B Skaggs, 'The Effect of Training upon Individual Differences Series I,' *Journal of Genetic Psychology*, 1936, Vol 49, pp 261–267 E B Skaggs, "Effects of Training on Individual Differences Series II," *Journal of General Psychology*, 1938, Vol 18, pp 357–366

Satisfactory methods are comparisons of gross gain, correlations between gross gain and initial performance, and comparisons of initial and final σ's Methods that do not seem adequate to the answering of the question are those that make use of per cent of gain, correlation between initial performance and per cent of gain, and coefficient of variability Since the three last-named methods all involve percentages, those whose initial performance is lowest are almost certain to "show" the greatest gain, even though their gross gain be negligible in comparison with that of the initially superior If *A* by practice increases his performance from 5 to 10, and *B*, from 30 to 45, there is more difference between them after practice than before, although *A* gains by the larger per cent

In general it is found that equalizing practice tends to increase individual differences, except when the results are expressed in per cent of gain or some other erroneous method Chapman obtained a correlation of 40 between initial scores and gross gain in mental multiplication, and a correlation of 20 between initial scores and gross gain in color naming [14] Race found that the initially superior made greater gross gain in addition and subtraction, and that the initially inferior made the greater gain in cancellation [15]

In his investigation in 1908 Thorndike obtained a positive correlation between initial performance in mental multiplication and gross gain by practice, which he generalized as follows "It seems extremely probable that the man who has the capacity to improve to a given small degree more quickly than another should also improve more quickly to the next degree and should also, by and by, be capable of improving to a higher degree if given the maximum of efficient training" Donovan and Thorndike [16] obtained a similar result

[14] J C Chapman, "Individual Differences in Ability and Improvement and Their Correlation," *Teachers College, Columbia University, Contributions to Education*, No 63, 1914

[15] Henrietta Race, 'Improvability, Its Intercorrelations and Its Relations to Initial Ability," *Teachers College, Columbia University, Contributions to Education*, No 124, 1922

[16] M E Donovan and E L Thorndike, "Improvement in a Practice Experiment under School Conditions," *American Journal of Psychology*, 1913, Vol 24, pp 426–428

for column addition in 1913 and Kirby,[17] for addition and division

These findings have been amply confirmed in subsequent work by Anastasi,[18], Perl, [19] Ewert,[20] and others, in respect to various kinds of activities In this work account has been taken of the fact that conclusions such as the foregoing are justified only in case there is reason to believe that the units of measurement are equal Thus, data are treated both in terms of raw scores and scale units

To the writer's knowledge there is no large body of data on the effect of schooling upon individual differences Henmon, who administered a standardized test in arithmetic to a group of pupils each month within the school year, found a positive relationship between initial performance and gross gain [21] Analysis of growth in reading between December and April of a school year by Boyd appears to indicate the same tendency [22]

Individual differences and quality of teaching From the foregoing we may infer that the presence in a school system of vast individual differences does not constitute an indictment of that system It is not a sign of poor teaching Only the absence of such differences should be disturbing If by good teaching is meant the developing of each student at a rate commensurate with his ability, then we may infer that the better the teaching the larger are the differences in progress likely to be

[17] T J Kirby, "Practice in the Case of School Children," *Teachers College, Columbia University, Contributions to Education*, No 58, 1913

[18] A Anastasi, "Practice and Variability A Study in Psychological Method," *Psychological Monographs*, 1934, Vol 45, Whole No 204

[19] R E Perl, 'The Effect of Practice upon Individual Differences," *Archives of Psychology*, 1933, Vol 24, Whole No 159

[20] H Ewert, "The Effect of Practice on Individual Differences When Studied with Measurements Weighted for Difficulty," *Journal of General Psychology*, 1934, Vol 10, pp 249–285

[21] V A C Henmon, ' Improvement in School Subjects Throughout the School Year," *Journal of Educational Research*, 1920, Vol 1, pp 81–95

[22] S Boyd, "Achievement as Related to Intelligence," *The Educational Index*, p 15 Columbus, Ohio State Department of Education, 1941, Bulletin R-6

SEX DIFFERENCES IN SCHOLASTIC ACHIEVEMENT

Sex differences in scholastic achievement have been noted almost from the inception of standardized tests A comprehensive summary of the early findings has been made by Lincoln [23] Featured in the latter work are the standardization data of the Courtis and Woody arithmetic tests, the Stone arithmetic reasoning tests, the Gray and the Monroe reading tests, the Ayres handwriting scale, the Buckingham spelling scale, the Van Wagenen history tests, and the Trabue language composition scale The foregoing may be summarized briefly as follows Girls excel consistently in arithmetic computation, boys, slightly, in arithmetic reasoning, girls are somewhat superior in reading rate, oral and silent, decidedly superior in speed and quality of handwriting and in spelling, and have a small advantage in English composition, boys excel in history and geography, perhaps in algebra, and rather definitely in geometry

The results of the many investigations that have appeared since the publication of Lincoln's book corroborate the above The sexes have also been compared in a number of different school subjects, a few of which are here mentioned Jordan, in analyzing the results of the North Carolina High School Senior Examination, found an advantage in favor of boys in history and general science and a slight advantage in mathematics [24] The girls excelled in English usage, in reading and in literature virtual equality obtained between the two sexes Traxler found high school boys and girls, equated in test intelligence, to be equal in reading rate [25] Boys were found to be superior to girls in physics, by Hurd, [26] in geometry,

[23] E A Lincoln, *Sex Differences in the Growth of American School Children*, Chapter IV Baltimore Warwick and York, 1927

[24] A M Jordan, "Sex Differences in Mental Traits," *The High School Journal*, 1937, Vol 20, pp 254–261

[25] A E Traxler, 'Sex Differences in Rate of Reading in the High School," *Journal of Applied Psychology*, 1935, Vol 19, pp 351–352

[26] A W Hurd, "Sex Differences in Achievement in Physical Science," *Journal of Educational Psychology*, 1934, Vol 25, p 70

by Foran and O'Hara,[27] and in general science, by DeKalb[28] Girls, high school and college, were found to excel in appreciation of literature by Carroll,[29] in English correctness tests by Sperry,[30] the advantage in both instances being marked Deutsche[31] found boys to be superior to girls on a test of concepts of causal relations, dealing with physical phenomena[32]

Samplings of the Iowa Every-Pupil Tests of Basic Skills, administered in connection with the Iowa Every-Pupil Testing Program, have been analyzed with respect to sex differences The test papers were segregated by tests, by grades, and by school buildings and arranged alphabetically within each such classification Every tenth paper was then drawn for purposes of the analysis The results are shown in Table XX, for Grades 3, 5, and 7 The minus sign is arbitrarily used to signify that the obtained difference favors girls, the plus sign signifies a difference in favor of boys[33]

Except for performance on the arithmetic tests, where there is a fractional advantage in favor of boys, the girls have a numerical advantage on every test at every grade level The

[27] T G Foran and Brother C O'Hara, ' Sex Differences in Achievement in High School Geometry," *School Review,* 1935, Vol 43, pp 357–362

[28] L F DeKalb, " Analysis of 1936 Iowa Every-Pupil Test of General Science," *Master's Thesis* University of Iowa, 1936

[29] H A Carroll, " Influence of the Sex Factor upon Appreciation of Literature," *School and Society,* 1933, Vol 37, pp 468–472

[30] M K Sperry, " A Critical Analysis of the Items of the English Correctness Test of the 1931 Iowa Academic Contest," *Master's Thesis* State University of Iowa, 1932

[31] J M Deutsche, " The Development of Children's Concepts of Causal Relations " in R G Barker, J S Kounin, and H F Wright (editors), *Child Behavior and Development,* Chapter VIII New York McGraw-Hill Book Co , 1943

[32] *Cf* W C Eells and C S Fox, " Sex Differences in Mathematical Achievement of Junior College Students," *Journal of Educational Psychology,* 1921, Vol 23, pp 381–386 F H Lund, " Sex Differences in Type of Educational Mastery," *Journal of Educational Psychology,* 1932, Vol 23, pp 321–330

[33] J B Stroud and E F Lindquist, " Sex Differences in Achievement in the Elementary and Secondary Schools," *Journal of Educational Psychology,* 1942, Vol 33, pp 657–667

TABLE XX

SEX DIFFERENCES IN ACHIEVEMENT ON THE IOWA EVERY-PUPIL TESTS OF BASIC SKILLS

Test and Grade	Number Boys	Number Girls	Mean Boys	Mean Girls	Dif	Critical Ratios
Silent Reading Comprehension Part I						
Grade III	351	362	22 85	24 97	−2 12	2 57
" V	346	374	38 30	39 59	−1 29	1 77
" VII	533	541	34 64	34 74	−0 09	13
Part II (Vocabulary)						
Grade III	351	362	18 62	20 22	−1 59	2 29
" V	346	374	31 71	33 41	−1 71	3 39
" VII	533	541	24 21	24 67	−0 46	0 85
Work Study Skills						
Grade III	334	343	28 28	29 09	−0 81	1 07
" V	350	366	50 60	53 49	−2 89	3 73
" VII	525	542	58 59	60 92	−2 33	2 45
Basic Language Skills						
Grade III	334	338	99 16	109 45	−10 29	5 38
" V	335	363	141 67	152 70	−11 03	7 56
" VII	531	541	198 31	215 54	−17 26	9 92
Basic Arithmetic Skills						
Grade III	334	348	25 87	25 21	+0 66	0 89
" V	345	378	58 14	57 92	+0 22	0 25
" VII	535	546	50 41	50 18	+0 22	0 24

Legend Pupils in Grades 3, 4, and 5 received the Elementary Battery of tests, those in Grades 6, 7, and 8 received the Advanced Battery This accounts for the fact that in most instances the pupils in Grade 5 earned higher numerical scores than those in Grade 7

same advantage obtains for Grades 4, 6, and 8, not shown in Table XX

Table XXI summarizes a portion of the data on sex differences in achievement at the high school level yielded by the Iowa Every-Pupil High School Testing Program between the years 1932–1939 In the majority of instances more than one set of values is listed for a school subject These represent different samplings in different yearly testing programs As in the preceding table, the minus sign signifies a difference in favor of girls [84]

[84] *Ibid*

TABLE XXI

SEX DIFFERENCES IN ACHIEVEMENT ON THE IOWA EVERY-PUPIL HIGH SCHOOL TESTS

Subject	Number Boys	Number Girls	Mean Boys	Mean Girls	Dif	Critical Ratios
Algebra	231	269	16 08	16 72	−0 64	86
"	530	468	14 94	16 03	−1 09	1 93
Plane Geom	498	502	13 42	12 20	1 22	3 65
" "	470	530	17 99	17 26	73	1 58
General Science	260	240	49 54	39 37	10 17	13 98
" "	548	452	47 60	40 70	6 90	8 80
Biology	384	375	61 28	57 74	3 44	2 98
"	546	454	63 32	62 1	1 22	1 37
Physics	479	521	37 94	31 78	6 16	5 13
Amer Govt	272	328	48 48	43 63	3 85	4 33
" "	449	551	61 03	48 37	2 68	2 61
Amer Hist	424	576	60 40	55 34	5 06	5 11
Contemporary Affairs 12th Grade	232	268	33 50	24 52	8 98	6 72
Economics	1122	1286	57 80	54 92	2 88	4 82
Read Compre	439	551	78 87	79 71	−0 84	77
English Correctness						

In the elementary school the advantage goes to girls, in high school, to boys This change on the part of boys from an inferior to a superior status probably comes about as a result of a change in the curriculum Two subjects in which girls have their most marked advantage, handwriting and spelling, do not feature prominently in the high school Those subjects in which boys excel in the elementary school, the sciences and the social studies, become expanded considerably in the high school curriculum Girls retain in high school the marked advantage in English usage, which they exhibit in the elementary school In reading comprehension and in mathematics the differences are small, with the exception of geometry, but tend more often than not to favor girls

On the whole, sex differences in marks received and in failure, retardation, acceleration, and like evidences of progress in school, are greater than those found in performance on educational achievement tests Ayres concluded in 1909 that "our schools as they now exist are better fitted to the needs and natures of the girl than of the boy pupil" [35] In examining the

TABLE XXII

PERCENTAGE OF PUPILS REPEATING AND SKIPPING GRADES PER *I Q* GROUP

I Q	Special Class and Repeating		Gaining a Year	
	Boys	Girls	Boys	Girls
140			66 7	100 0
130			18 2	33 3
120			23 3	34 5
110	3 6	2 6	11 9	9 0
100	24 4	18 8	3 0	1 8
90	59 2	48 8	1 5	0 8
80	88 9	86 4		
70	100 0	100 0		
60	100 0			

records of several hundred thousand pupils in various cities of the nation in 7624 high schools analyzed by him in 1906–1907 Ayres found that there were 419,570 girls enrolled, in comparison with 314,084 boys In the elementary schools of 15 cities, having an enrollment of 282,179 pupils, 37 1 per cent of the boys and 32 8 per cent of the girls were retarded Repeating grades were 22 8 per cent of the boys and 20 2 per cent of the girls

St John has compared the two sexes with respect to the percentage, at the various *I Q* levels, being required to repeat a

[35] L P Ayres, *Laggards in Our Schools,* p 158 New York Russell Sage Foundation, 1909

grade and the percentage earning an extra promotion [86] His data treat the progress, over a four-year period, of about 500 boys and 450 girls in Grades 1 to 6, mostly 1 to 4, who were enrolled in the various schools of a certain suburb of Boston The comparisons are shown in Table XXII

Girls received higher marks in conduct and effort This result is reflected, perhaps, in the fact that the correlations between *I Q* and various measures of achievement were higher for girls than for boys

Johnson's analysis of the records of boys and girls for one semester in 7 high schools in St Louis is to the same purpose [87] The sex comparisons are as follows

	Boys	Girls
Number courses repeated first time	2,110	1,517
" " " second time	337	166
" " " third time or more	71	19
Per cent failure at end of term	8 5	5 0
Average age of graduating class	17 7	17 1
Median *I Q*	105 3	104 8

Ayres attributed the poor showing of boys to "overfeminization" of our schools St John voices a similar note, as is seen in the following "the consistent inferiority of the boys in school progress and achievement is due chiefly to a maladjustment between the boys and their teachers which is the result of interests, attitudes, habits and general behavior tendencies of boys to which the teachers [in his investigation all women] fail to adjust themselves and their school procedures as well as they do to the personality traits of girls" In this opinion Johnson concurs The latter is also of the opinion that teacher appraisal of scholastic achievement is not without sex bias He points out that in high school subjects taught by men boys and girls receive comparable marks It may be, however, that men are

[86] C W St John, 'The Maladjustment of Boys in Certain Elementary Grades," *Educational Administration and Supervision,* 1932, Vol 18, pp 659–672

[87] G R Johnson, "Girls Lead in Progress through School," *American School Board Journal,* October, 1937, Vol 95, pp 25–26

more likely to be found teaching those courses in which boys are known to do their best work

There are also other aspects to the problem No doubt boys feature in disciplinary problems with much greater frequency than do girls There appears to be no necessary reason to assume that all so-called behavior problems are symptomatic of maladjustment Some of them, in fact many, probably reflect group mores A certain amount of protest is in masculine mores at the juvenile level Indifferent co-operation and a certain amount of nonchalance about his lessons and general "cussedness" are not only condoned in certain juvenile masculine groups, but also rewarded The fact that men in general are ostensibly as well adjusted as women seems to accord with the notion that a portion of the so-called maladjustment of boys may be attributed to adherence to custom For example, the boy who trips a fellow student perambulating down the aisle bent on consulting his teacher is as likely to be suffering from the inner compulsion to have some fun as he is from some deep-seated conflict within his soul

Inasmuch as girls are superior in language functions in school it may be of interest to point out, as a final word on sex differences, that this feminine superiority in language obtains from the start Indeed there is more than a suspicion that this feminine superiority in language aptitude also holds in adult life McCarthy obtained the following means for certain age groups for girls and boys (average for 50 consecutive samples taken under standard conditions) [38]

C A	Mean No Words		Mean No Different Words	
Months	Girls	Boys	Girls	Boys
18	28 9	8 7	13 6	5 4
24	87 1	36 8	37 3	16 6
36	176 2	164 4	66 0	60 1
48	218 5	213 4	93 8	91 1
54	236 5	225 4	104 0	95 8

[38] D McCarthy, "Language Development of the Preschool Child," in R G Barker, J S Kounin, and H F Wright, *op cit*, pp 107–128

SOCIO-ECONOMIC FACTORS

During the latter part of the 19th century, when the American high school was becoming established, there was considerable criticism of the American plan by German educational thinkers This plan envisaged a general education for all American youth up to the completion of the high school program On the other hand, German educators were advocating a standard educational program for all children up to the age of 10 At this time those who were going into agricultural pursuits should specialize in that vocation The remainder were to pursue the general course up to the age of 13, at which time those going into the mechanical trades were to begin to specialize in appropriate vocational training Those going into commercial pursuits were to continue in the general curriculum up to about 14 years of age and thereafter specialize in courses appropriate to their vocation The remainder were to receive what corresponds to our high school education and subsequently to enter the universities and then the professional schools

In our own distinctive American experiment in universal high school education at public expense we have gone on the assumption that for free, responsible citizenship in a democracy all our youth should have the advantages of a general education up to and including the secondary level As is well known to the student of education, this goal has not been fully realized It has been accelerated enormously by a number of factors, including child-labor legislation, the great economic depression and the attendant unemployment But even at the peak not more than 75 per cent of the boys and girls of high school age have been enrolled in school As high schools have been operated in the past this percentage, granting perfect selection by ability, begins to approach the percentage that is actually capable of doing satisfactory secondary school work

Incidentally, the growth, in enrollment, in the American high school may be of some interest to the reader The approximate enrollment, in percentage of youth between the ages of 14 and

17 in school, by decades from 1890 is as follows 1890, 8, 1900, 11, 1910, 17, 1920, 38, 1930, 51, 1940, 70–75, the latter being an estimate

Thus, while there is no thought that the youth of America are equal in ability, we have by a wise provision made educational opportunities somewhat equal The son of a day laborer has the opportunity of a general education at public expense for 12 years of his life, and may if his ability and means warrant, enter any vocation or profession of his choosing

The fact remains however that in America class distinction still is a factor of major consequence, though we have provided equal educational opportunity in an objective sense In the first place there is a rather close association between the occupations of fathers and the persistency of their children in school The amount of formal schooling of the parents is also a factor associated with the amount of formal schooling received by their children As the percentage of high school attendance has increased, education in America has necessarily become less selective, but there is little doubt that the socio-economic status of the home is still a matter of considerable significance in determining persistence at the secondary school level, as is seen presently [89]

In the second place, scholastic achievement of pupils actually in school, at all grade levels from the first to the twelfth, is positively correlated with socio-economic ratings of their homes This is inferable from the known relationship between socio-economic status and test intelligence, and the relationship in turn between test intelligence and scholastic achievement But when test intelligence is held constant, socio-economic ratings of the home are still found to be importantly correlated with success in school, as evaluated by the usual standards — marks earned, scores on standardized achievement batteries, and promotion and failure The writer in a recent article has

[89] C E Holley, *The Relationship between Persistence in School and Home Conditions,* Fifteenth Yearbook, Part II, pp 9–119, National Society for the Study of Education Chicago University of Chicago Press, 1916 G S Counts, "The Selective Character of American Secondary Education," *Supplementary Education Monographs,* 1922, No 19

summarized a portion of the experimental data [40] The obtained correlations between socio-economic status and school marks are at least equal to those obtained between test intelligence and marks Results of two investigations are here given, in part, those of Engle [41] and of Shaw [42]

Engle compared the academic achievement, based on letter grade attainment, of high school pupils drawn from three socio-economic strata, in a certain midwestern city The privileged group were selected from subjectively rated well-to-do homes, the underprivileged, from homes that had received public assistance The third group was drawn by random selection from the remainder of the students

Group	Letter Grade				
	A	B	C	D	E
Underprivileged					
Number	21 5	80 5	152	147 5	55
Per Cent	4 7	17 6	33 3	32 3	12 1
Random					
Number	54	92	137 5	139	34
Per Cent	11 8	20 2	30 1	30 4	7 4
Privileged					
Number	86	42 5	130	82	21
Per Cent	18 6	30 9	28 2	17 8	4 5

Shaw administered the Stanford Achievement batteries, the Otis Self-Administering Intelligence Test, and the Sims Score Card, the latter a socio-economic rating scale, to all the pupils in Grades 4 to 8 in a city of about 4000 inhabitants He also made use of average school marks The results are shown in terms of correlation coefficients, as follows

[40] J B Stroud, "Predictive Value of Obtained Intelligence Quotients of Groups Favored and Unfavored in Socio-economic Status," *Elementary School Journal,* October, 1942, Vol 43, pp 97–104

[41] T L Engle, "Home Environments and School Records," *School Review,* 1934, Vol 42, pp 590–598

[42] D C Shaw, "The Relation of Socio-economic Status to Educational Achievement in Grades Four to Eight," *Journal of Educational Research,* 1943, Vol 37, pp 197–201

r Stanford Achievement *E Q*'s and Sims scores	= 41
r Otis *I Q*'s and Sims scores	= 31
r School marks and Sims scores	= 38
r E Q's and Sims scores, *I Q* partialed out	= 27

McCarthy found a marked relationship between fathers' occupations and length of sentence (number of words per response) for preschool children [48]

The findings with respect to the scholastic achievement of Negro pupils, although admittedly the socio-economic factor may be complicated with a racial factor, point in the same direction Negro children on the average are inferior to white children in socio-economic background Then scholastic attainment is considerably below the median attainment of white children, but on a par with that of white children of comparable socio-economic status [44]

Academic achievement of orphanage children It has been known long since that orphanage children are as a group quite inferior in test intelligence to children of like age in the general population In 1922 Cobb reported that whereas 50 per cent of a sampling of non-dependent children (ages 4 to 18 years) earned *I Q*'s ranging between 92 and 107, only 20 per cent of a like group of dependent children fell within this range The *I Q* limits of the middle 50 per cent of her dependent group were 72–90 [45] Other investigators, notably Pintner,[46] Gesell,[47]

[43] *Op cit*

[44] T R Garth, B E Lovelady, and H W Smith, "The Intelligence and Achievement of Southern Negro Children," *School and Society*, 1930, Vol 32, pp 431–435 D A Wilkerson, "Racial Differences in Scholastic Achievement," *Journal of Negro Education*, 1934, Vol 3, pp 453–477 See also L D Willis, "A Comparative Study of the Reading Achievements of White and Negro Children," *Peabody Journal of Education*, 1939, Vol 17, pp 166–71

[45] M Cobb, "Mentality of Dependent Children," *Journal of Delinquency*, 1922, Vol 7, pp 132–140

[46] R Pintner, "The Mentality of the Dependent Child with a Plan for a Mental Survey for an Institution," *Journal of Educational Psychology*, 1917, Vol 8, pp 222–238

[47] A Gesell, *Exceptional Children and Public School Policy* New Haven Yale University Press, 1922

Burt,[48] and Davis,[49] have obtained results of the same character Stenquist, Thorndike, and Trabue have obtained evidence of concomitant retardation in academic progress, the amount of retardation increasing with age [50]

TABLE XXIII

COMPARISON OF FIFTH-GRADE ORPHANAGE CHILDREN WITH FIFTH-GRADE PERCENTILE NORMS

TEST	Percentile norms of scores corresponding to orphanage 25th, 50th, and 75th percentiles		
	25th	50th	75th
Reading Comprehension	11	20	39
Spelling	8	29	54
Sentence Usage	18	43	66
Arithmetic	8	24	56

Legend The reading comprehension score corresponding to 25th percentile, of 5th-grade orphanage children is 28 The 5th-grade percentile norm corresponding to a score of 28 is 11 The score corresponding to the 50th percentile in the orphanage population corresponds to the 20th percentile in the 5th-grade norms

In a recent investigation Nelson administered the Iowa Every-Pupil Tests of Basic Skills to 514 orphanage children, Grades 3 to 8, in 12 orphans' homes in northern Illinois [51] Of these, 327 were attending institutional schools, 187, public schools The results, in part, for the fifth grade are given for purpose of illustration The findings for the other grades and the other tests are comparable For the orphanage population the scores corresponding to the 25th, 50th, and 75th percentiles were com-

[48] C Burt, *Mental and Scholastic Tests* London P S King and Son, Ltd, 1927

[49] R Davis, *Mentality of Orphans* Boston Gorham Press, 1930

[50] J L Stenquist, E L Thorndike, and M R Trabue, "The Intellectual Status of Children Who Are Public Charges," *Archives of Psychology*, 1915, Vol 5, No 33

[51] D M Nelson, "The Academic Achievement of Orphanage Children," *Master's Thesis* State University of Iowa, 1942

puted, and corresponding Iowa Every-Pupil percentile norms were found The data for four tests, Reading Comprehension, Spelling, Sentence Usage, and Fundamental Arithmetic Operations are given in Table XXIII, for the fifth grade

The amount of retardation of orphanage children in this investigation is actually considerably greater than the data indicate because these children were prevailingly over-age for their grades

THE ROLE OF SOCIAL CLASS IN AMERICAN EDUCATION

Continuance in school As noted in the previous section of this chapter, whereas American public schools were founded and are sustained on the philosophy that all our youth are entitled to receive an elementary and secondary education at public expense all classes are not taking equal advantage of the opportunity Recent emphasis has been given to this problem in the American Youth Commission's survey in Maryland, based upon a sampling of 13528 youth, between the ages 16 and 24 years [52] Of this number 2620 (approximately 19 per cent) were in school Of the 10908 youth permanently out of school 39 1 per cent had not gone beyond the eighth grade, 23 7 per cent had completed the ninth, tenth, or eleventh grade, 26 5 per cent had graduated from high school, and 10 7 per cent had attended college

Listed among the factors affecting continuance in school are *race, relief status, sex, size of family,* and *fathers' occupation* The probability is twice as great, according to the results of the survey, that a Negro youth or a youth whose family is on *relief* will not have exceeded the eighth grade as for white and non-relief youth Forty-five per cent of the boys as compared with 32 per cent of the girls had not gone beyond this grade For families of 1, 4, 7, and 9 children the percentage not going beyond the 8th grade is 22 2, 35 0, 52 4, and 66 1, respectively The percentage according to the usual occupation of the father is as follows

[52] H M Bell, *Youth Tell Their Story,* American Council on Education, 1938

Father's occupation	Per cent not exceeding eighth grade
Professional – technical	7 6
Office	11 1
Sales	14 2
Managerial	16 2
Skilled	32 5
Domestic – personal	39 1
Semi-skilled	43 0
Farm owner – tenant	48 8
Unskilled	66 1
Farm labor	86 3

Table XXIV, adapted from Bell's report, shows the relation between fathers' occupation and grade successfully completed by out-of-school youth The occupational or economic factor probably pervades all others Although the racial factor looms large, the median grade attainment of colored youth being 7 5 and that of white youth, 10 8, in this investigation, it is probable, as Bell points out, this difference is economic in large measure When fathers' occupation is held constant racial differences in grade attainment are comparatively small Racial discrimination, which is probably also economic to a degree, may be a factor also

Of equal interest are the data on the occupational classifica-

TABLE XXIV

RELATIONSHIPS BETWEEN GRADE COMPLETION OF OUT-OF-SCHOOL YOUTH AND OCCUPATIONS OF THEIR FATHERS

Class of occupation	Percentage completing various grades				
	8th or less	9th, 10th, 11th	High school	1, 2, 3 yrs col	4 yrs col
Professional – technical	7 6	14 7	32 8	23 8	21 1
Sales	14 2	24 9	40 2	14 9	5 8
Skilled	32 5	31 7	29 1	4 8	1 9
Farm Owner – tenant	48 8	17 1	27 4	4 9	1 8
Unskilled	66 1	21 0	10 7	1 8	0 4

tion (of fathers) of youth who left school before high school graduation In the professional-technical class there were 4 such out of every 20, in the unskilled class there were 18 out of every 20

Neufeldt found that of 276 youth in a certain high school in a midwestern city who dropped out of school before graduation (and who continued to reside in the city) between the years 1935–1939, 58 per cent came from families earning less than $1000 per year, whereas 1 1 per cent came from families earning more than $3000 per year [53] Karpinos, in his analysis of 1940 United States Census data for all geographic regions of the country, found the following percentages per income group of white urban male youth, between 16 and 17 years of age, to be in school under $1000, 68, $1000–$1999, 81, $2000–$2999, 88, $3000 and above, 92 For all income groups at this age level, the percentage is 76 7 [54]

Bell lists the factors accounting for persistence in school, in the order of their importance, as follows occupation of father, race, and sex All these factors are quite complex Occupation is first of all, but by no means entirely, economic A concomitant factor is the amount of formal schooling received by both the father and mother The social example of other youth of the same class — social example and social pressure of the youth in the upper classes and the absence of either in the lower classes — and allied conditions are factors However, the economic factor as such is by no means inconsequential The cost to the pupil or to his family of such items as transportation, books, clothing, and activities is ordinarily larger than is commonly supposed

Jacobson has made a careful analysis of student expenditures in 134 high schools in representative cities in various geographical regions of the country for the year 1942–1943 [55] Students

[53] C J Neufeldt, "A Study of the Relationship between Socio-economic Status and Continuance in School," *Master's Thesis* State University of Iowa, 1943

[54] B D Karpinos, "School Attendance as Affected by Prevailing Socio-economic Factors," *The School Review*, 1943, Vol 51, pp 39–49

[55] P B Jacobson, "Cost to Students in Attending High School," *The Bulletin of the National Association of Secondary School Principals*, January, 1944, Vol 28, pp 3–28

submitted weekly cost sheets showing all expenditures made in connection with school attendance, including carfare, clothing, lunches, excursions, fees, dues, admissions to activities, school supplies, contributions, and the like These records were obtained for periods ranging from 8 to 20 weeks, beginning with January, 1943 The cost data were multiplied by a factor to arrive at an estimate of expenditures for the school year Perhaps this procedure would yield a conservative cost figure, inasmuch as the heaviest expenditure for clothing, books, and supplies would probably be made earlier in the school year The mean expenditure was $78 61 The outlay varied considerably with size of city — the average for cities under 1000 being $58 50, and for cities over 100,000, $103 50, and with the school grade — the average for the 9th grade being $57 00, and for the 12th grade, $99 88 Other investigators have obtained higher expenditure figures than those reported by Jacobson For example, Hand obtained a national average of about $125 [56]

Academic achievement As indicated in the previous section, youth from the unfavored economic and social strata do not take to schooling like those from more favored strata On the whole, pupils from the unfavored homes find learning difficult — at least their achievement is nothing comparable with that of the pupils from the favored homes Their poor showing does not seem to be due entirely to a lack of interest — at least immediate lack of interest, because, as is seen in Chapter X, there is a mean difference of 24 points in *I Q* between children of the highest and lowest occupational classifications Related — at least concomitant — factors are differences in the quality of home training and stimulation

Participation in extra-curricular activities As another instance of the selective character of American education, attention is called to the association between socio-economic status and participation in extra-curricular activities In a recent investigation Smith found, at the high school level, the mean socio-economic score (Sims Score Card) of participants, adjusted for sex and grade level, to be higher than the mean

[56] H C Hand, in *General Education in the American High School*, pp 3–40 Chicago Scott, Foresman and Co , 1942

score for the school as a whole in 28 out of 31 activities [57] Twenty of the differences are significant at the one per cent level In nine of the activities the means of the participants are a standard deviation or more above the school mean Smith's findings confirm an earlier investigation by Wright [58]

Perhaps all the foregoing factors are interacting at least to a degree It is reasonable to suppose that unprivileged children tend to be "frozen out" of high school because the going for them is tough, academically speaking, because high school is too expensive, because they are somewhat excluded from the social life of the school, as indicated by their unequal participation in extra-curricular activities It is also probable that *social example and social pressure for continuance in school* are not felt by unprivileged youth to the extent they are by their better privileged fellows Moreover their vocational aspirations are not so often premised upon a high school education

The curriculum Our secondary schools are selective in the choice of curricula Warner, in his investigation of "Yankee City," found four curricula two, college preparatory, one, a commercial course designed to prepare the pupil to secure a job upon leaving high school, and one, a general curriculum designed to meet the immediate educational needs of life upon graduation [59] All the upper class pupils in "Yankee City" were taking one or the other of the college preparatory courses, 88 per cent of the upper-middle class, 45 per cent of the lower-middle, 28 per cent of the upper-lower, and 26 per cent of the lower-lower class were taking these courses In this New England city of 17000 inhabitants, 3 per cent belonged to the upper class, 10 per cent to the upper-middle class

Implications for our democratic society It is obvious that in America class stratification exists in school Warner suggests, "reforms cannot be achieved in our educational sys-

[57] H P Smith, "A Study of the Selective Character of American Secondary Education Participation in School Activities as Conditioned by Socio-economic Status and Other Factors," *Doctor's Dissertation* State University of Iowa, 1943

[58] D Wright, "Student Participation in Extra-curricular Activities by Welfare Levels," *Master's Thesis* Stanford University, 1939

[59] W L Warner, "Educative Effects of Social Status," *Supplementary Educational Monographs, University of Chicago*, 1942, No 54, pp 16–28

tem unless the general society, in which the school operates, is transformed into a truly democratic order" But, as noted in Chapter I, our system of free education is a means of leveling class barriers, and stands as democracy's best implement Even so, lower class youth are handicapped It would seem that an essential of democracy in a socially stratified society, such as our own, is high class-mobility, or freedom to move from one social stratum to another Two conditions seem to be necessary to the realization of this goal economic opportunity and the continuance of educational opportunity Perhaps, this may mean the extension of educational opportunity However, it would seem that educational opportunities are now far ahead of economic and social opportunities "Room at the top" may be accepted as a sociological fact only with reservation

In this consideration it is of the greatest importance that, in terms of total number, the lowest social group contributes several times as many bright children as the highest social group It is only in percentage that they compare unfavorably Even the lower-lower class contributes about 3000 children with *I Q*'s above 100 to every 800 such children contributed by the professional class (assuming that there are five families in this class to one in the professional class and that they are twice as large, that the mean *I Q* of the former is 92 and that of the latter is 116, and that the *S D* is 16)

Approximately 7 per cent of the lower-lower and upper-lower class youth (combined) have *I Q*'s of 116 or better, 116 being about the average *I Q* of college students The percentage of middle class youth (lower and upper) equaling or exceeding this *I Q* value is about 16, whereas 50 per cent of the upper class will equal or exceed this figure It should be kept in mind that 116 is not the minimum but the average of college students, and that many do successful work with less than average (116) *I Q* Since less than 5 per cent of adult males are employed in the major professions, it is obvious that there is not room here for all the talent available Even when we add managerial, executive, and semiprofessional occupations, which employ some 5 or 6 per cent, we still have more talent than opportunity In competition, upper and upper-middle classes

have much the advantage not only in securing the necessary college and professional training but also in getting ahead in their profession or business

Personality development and social class A final word is added about the role of social class in our schools in the shaping of personality Attention has already been called to the selective factor of social class in participation in extra-curricular activities This factor seems to operate even to a greater extent in the informal life of the school, as seen in the social cliques An underprivileged girl, for example, has no great chance of learning the manners and customs of her more privileged fellows if she is excluded from the more important social contacts, is not invited into their homes, and otherwise not accepted as a member As stated in Chapter III, physical membership, in the sense of attending the same school or sitting in the same classroom, is not enough To the extent that she is forced to associate with her own class she tends to take on the behavior, attitudes, and traits peculiar to this class To this extent our schools do not make for democracy but for the continuance of social stratification [60] It is not as if the barriers were never crossed But the problem is serious and in need of careful attention by educational leaders

THE QUESTION OF NON-PROMOTION

It is not possible to do more than approximate the percentage of pupils in the elementary school who are not promoted for a given year At present the figure may be placed conservatively at more than 5 and less than 10 per cent This is considerably less than formerly, but even so the threat of failure is still very real to a fairly large percentage of pupils Now as formerly the first grade bears an unequal share of failures, and a greater percentage of boys fail than of girls

From his investigation for the years 1907–1908 Ayres concluded that the average rate of non-promotion for all grades was 16 per cent It was reported to be 11 per cent in New York City in 1912 Berry found the rate to be 9 1 per cent in the

[60] *Cf* Warner, *op cit*, and J S Roucek and associates, *Sociological Foundations of Education* New York Thomas Y Crowell Co, 1942

state of Michigan for the years 1915–1916 [61] Caswell reported the average rate of non-promotion in 36 cities in seven states to be 10 per cent for all grades, in 1933 [62]

All investigators report wide variations in per cent of non-promotions from system to system, and from school to school within the same system The former indicates that different cities have different policies, which is quite understandable The fact that there are wide variations from school to school within the same city does not indicate, as some writers have suggested, a lack of policy Neither does the fact that there is no consistent relationship between achievement and non-promotion Differences in achievement from school to school within the same city are usually quite large, depending, of course, upon the degree of social and economic stratification In general it is safe to say that the differences within cities, as from school to school, are greater than the differences between cities (differences between city means) Since this is so, it follows that a pupil might not be conspicuously low in one school and hopelessly outclassed in another

The foregoing is not an endorsement of present policies with regard to non-promotion This issue is discussed presently But we have non-promotion in our schools It is contended that if we are to continue to follow this practice, the administrative authorities should not undertake to decide who shall fail There should be no minimum or uniform standards that are to apply alike in all classes and all schools within a system Again, if we are to have non-promotion it is quite thinkable that of two scholastically equal pupils one should be promoted and the other not Since the principal argument against non-promotion, aside from the fact that it may not accomplish its purpose, is psychological, each case should be settled upon the basis of all available facts For one thing the decision may depend upon the family's accepting non-promotion to the extent that the pupil can live with it without threat to his sense

[61] C S Berry, *Seventy-ninth Annual Report of State Superintendents of Public Instruction of the State of Michigan* Lansing, 1915–1916

[62] H L Caswell, *Non-promotion in Elementary Schools*, Division of Surveys and Field Studies, Field Studies No 4 Nashville George Peabody College, 1933

of security in the home It is thinkable that in some cases the pupil has formed close friendships within his class and is otherwise closely integrated with the social life of its members both in school and at home Such an event would be an argument in favor of promoting him In other cases a pupil might have no such attachments or might even welcome other classmates It is such factors as these which the teacher, principal, school psychologist, visiting teacher or others may know They should make the decisions

We must face frankly the question of whether or not failure accomplishes its purpose, which presumably is to bring the pupil to a better mastery of instructional materials of his grade and to prepare him the better for the grades ahead Is this being accomplished by non-promotion at the present time? While there are doubtless many exceptions, the best general answer, probably, is no Typically the pupil who repeats a grade is near the bottom of his class the second time He does, of course, increase in mental age by, perhaps, from seven- to nine-tenths of a year, assuming that his *I Q* is somewhere between 70 and 90 The foregoing assumes that the pupil who repeats a grade takes the same work over, more or less If we gave him a different program the results might be different

The practice of non-promotion would be justified, so far as its purpose is concerned, if it could be shown that the pupil was more successful in carrying out the work of the succeeding grades Here again the data at hand afford little evidence in general that the failing of pupils accomplishes its purpose [68] However, this question cannot be decided by professors any more than it can by superintendents and school boards The teachers and principals, who have to live with the problem, should have considerable voice in the matter, although they should be guided by evidence as well as personal experience One other point should be mentioned, namely that schools that have high rates of failure do not seem to accomplish any more than schools having low rates of failure

[68] *Cf* H L Caswell, *Education in the Elementary School,* Chapter XI New York American Book Co , 1942

Even if it could be shown that failure were scholastically feasible, might not the detrimental psychological effects outweigh the scholastic advantages? It must be admitted that we do not now have any very reliable means of assessing these effects It must suffice for the present to reiterate a point made in Chapter VIII, namely that we do not remove all the detrimental psychological effects merely by abolishing failure We do not eliminate the consequences of failure just because we abolish formal failure These pupils still fail to do well It is thinkable that there are some detrimental psychological effects from continued promotion, as the pupil becomes more and more outclassed as he progresses from grade to grade The problem is not so simple as securing ratification of a policy of universal promotion by the school board

Much depends on how these matters are handled It is difficult to say how a policy of non-promotion or of universal promotion might work under ideal conditions The effectiveness of either must depend very largely upon what is done about it after the slow learner has been failed or promoted [61]

CHRONOLOGICAL AGE

Age before maturity Prior to the advent of experimental child psychology, childhood was regarded as the golden age of memory The stocking of the child's mind in his youth, at a time when he is too immature to be trusted with much thinking for himself, with an array of factual knowledge would, it was held, yield a bountiful harvest in mature life Childhood was alleged to be the age of memory because it is easier at this time of life to commit to memory the store of knowledge required afterward than to commit it at a mature age Such a point of view naturally led to the placing of great emphasis upon memorization in the elementary school Fortunately this practice has been discontinued Today teachers in the ele-

[61] *Cf* W W Cook, *Grouping and Promotion in the Elementary School*, Series on Individualization of Instruction, No 2 Minneapolis University of Minnesota Press, 1941 C M Saunders, *Promotion or Failure for the Elementary Pupil* New York Bureau of Publications, Teachers College, Columbia University, 1941 R S W Templin, 'A Check-up of Non-promotions," *Journal of Education*, 1940, Vol 123, pp 259–260

mentary grades are as much interested in logical or substance learning as those at any other level Moreover, knowledge of the development of intelligence, from Binet onward, and any reasonable application of Herbartian psychology should have led to the conclusions that ability in substance learning and memorization of meaningful material increases with age up to mental maturity, even before this fact was demonstrated by experimental work It now seems fairly conclusive that the child does not even have an advantage in the memorization of rote material

TABLE XXV

RELATION OF AGE TO POETRY AND NONSENSE SYLLABLE SCORES

Mean *C A*	Mean *I Q*	Mean No Lines	Mean No Syllables
7 7	115	9 71 ± 54	4 73 ± 19
8 5	115	11 16 ± 43	5 12 ± 21
9 4	115	13 15 ± 47	5 82 ± 23
10 4	111	16 02 ± 56	6 43 ± 24
11 7	103	17 55 ± 65	6 74 ± 24
14 4	109	21 31 ± 89	7 39 ± 30
18 1	114	22 14 ± 65	8 71 ± 39

N = 172 elementary school pupils, grades 2 to 6 inclusive, 26 ninth grade pupils, and 28 college freshmen

The writer, in collaboration with Maul, investigated the relationship between chronological age and proficiency in memorizing selections of poetry and lists of nonsense syllables The verses were adapted to the understanding and interest of the youngest age groups The scores are given in terms of mean number of lines learned within a constant time limit, 15 minutes, and the number of syllables so learned in 10-minute periods, by the progressive-part method In an investigation of this kind it is desirable that age samples are comparable with respect to brightness [65] As is seen in the second column of Table XXV this condition was met fairly well, with but one exception

[65] J B Stroud and R Maul, "The Influence of Age upon Learning and Retention of Poetry and Nonsense Syllables," *Pedagogical Seminary and Journal of Genetic Psychology*, 1933, Vol 42, pp 242–250

In 1896 Shaw published the results of an investigation bearing on the influence of age upon achievement in logical or substance learning His subjects were 50 boys and 50 girls in each of the following Grades, 3, 5, 7, 9, second-year high school, and fourth-year high school [66] A specially prepared story was read to pupils, who, in turn, wrote down as many of the terms — facts and concepts — as they could remember, exact phrasing and temporal sequence not being insisted upon A total of 152 such terms were contained in the story Table XXVI gives the average number of terms reproduced per grade group [67]

A positive relationship has been found with various other

TABLE XXVI

PER CENT OF TERMS REPRODUCED

Grade	3	5	7	9	HS-2	HS-4
Score	17 5	31	40	43	45	42 5

[66] J C Shaw, "A Test of Memory in School Children," *Pedagogical Seminary*, 1896–97, Vol 4, pp 61–78

[67] A wealth of related data supports the findings relative to the relationship between age and learning ability Studies in memory span for digits, the number that can be correctly reproduced from a single representation, usually auditorially, show an increase with age, as follows age 4–5 years, 4 digits, 6–8, 5 digits, 9–12, 6 digits, 13–15, 7 digits Bolton found in the case of pupils ranging in age from 8 to 15 inclusive, 100 per grade, the following percentages of correct responses in attempting to reproduce 6 digits immediately after a single presentation 43 7, 54 5, 57 5, 67 6, 68 7, 72 3, 76 5, and 74 7 (T L Bolton, "The Growth of Memory in School Children," *American Journal of Psychology*, 1892, Vol 4, pp 362–380 See also E A Kirkpatrick, "An Experimental Study of Memory," *Psychological Review*, 1894, Vol 1, pp 602–609) In the Stanford-Binet Intelligence Test (1916) Terman found that 70 per cent of 3-year-old children could reproduce 3 digits correctly in one trial out of three or better, and that 62 per cent of superior adults could reproduce 8 correctly in one out of three trials or better In the same standardization procedure, Terman found that 70 per cent of 3-year-old children could reproduce sentences or phrases of 6 to 7 syllables in one trial out of three or better, that 69 per cent of 6-year-olds could so reproduce sentences of 16 to 18 syllables, and that 58 per cent of the 16-year-old group could reproduce 28 syllables (L M Terman, *et al*, *The Stanford Revision and Extension of the Binet-Simon Scale for Measuring Intelligence*, pp 165–177 Baltimore Warwick and York, 1917)

learning activities Cases in point are Pyle's [68] investigations of prose-substance learning, and perceptual-motor learning, Heidbreder's [69] work on relational learning, and Burt's,[70] on reasoning

Relationship between C A and learning achievement, M A being constant There is, of course, no efficacy in age as such Increase in age is important because it is a necessary condition to mental development This is so whether mental development be a function of learning and transfer effects or organic maturation, or both In so far as *M A*, assessed by standard intelligence tests, is a true index of mental development, so far should sheer *C A* be unrelated to learning ability Negligible relationships only have been found between *C A* and learning achievement when *M A* is held constant The writer and Maul obtained a correlation of 61 between poetry scores and *C A*, and of 49 between nonsense-syllable scores and *C A* When *M A* was partialed out, the coefficients dropped to 03 and — 02, respectively [71] Roberts' data for the ages 3 6–7 10, published the same year, are in accord She obtained a correlation of — 40 between *C A* and the number of trials required to learn a certain multiple-choice problem This was reduced to — 17 when *M A* was partialed out [72]

After maturity In studying the relationship between age and learning achievement in childhood the condition of drawing comparable samples from the various age groups is satisfied when these age groups are comparable in brightness, that

[68] W H Pyle, *Nature and Development of Learning Capacity* Baltimore Warwick and York, 1925

[69] E F Heidbreder, "Problem Solving in Children and Adults," *Journal of Genetic Psychology*, 1928, Vol 35, pp 522–544

[70] C Burt, "The Development of Reasoning in School Children," Part I, pp 68–77, Part II, pp 121–127, *Journal of Experimental Pedagogy*, 1919, Vol 5

[71] *Op cit*

[72] K E Roberts, "Learning in Preschool and Orphanage Children An Experimental Study of Ability to Solve Different Situations According to the Same Plan," *University of Iowa Studies in Child Welfare*, 1933, Vol 7, No 3 *Cf* A W Reitz, "Relationship of Acquired Information or Knowledge Obtained from Certain Educational Motion Pix Films to the Intelligence, Grade, Age, Sex and Type of Educational Training of Pupils," *Journal of Educational Sociology*, 1938, Vol 12, pp 177–181

is, comparable in *I Q* – since *I Q*'s do not change systematically from early life to maturity For older age levels the problem does not lend itself to such ready experimental handling, owing to the fact that test intelligence decreases with age during this period Here experimenters have undertaken to draw successive age samples that are continuous with the just mature sample in the sense that they are drawn from comparable segments of the population The Bellevue Intelligence Tests should

TABLE XXVII

AVERAGE TIME, IN MINUTES, FOR LEARNING 20 DIGITS AND 20 NONSENSE SYLLABLES BY DIFFERENT GROUPS OF SUBJECTS

	Modal Age	Score
40 Grammar school girls	14	16 7
24 Trade school boys	16	15 3
60 High school pupils	17	17 0
132 Normal school girls	21	14 5
24 Asylum attendants	25	16 2
12 Clerks and businessmen	30	16 1
16 Graduate students and professors	32	14 0

prove to be a valuable addition to methodology inasmuch as the *I Q*'s yielded by this scale appear to be free from systematic change as persons grow older (see Chapter IX)

Scattered and incidental results have appeared in the psychological journals almost from their inception In nearly every instance, the age samples are so drawn as to make it highly probable that they were not drawn from continuous segments of the population The results reported in Table XXVII are typical [73]

In 1928 Jones published the results of an investigation on the relationship between age and ability to report upon the content of three motion-picture narratives, as determined by objective tests His age samples appear to have been well chosen

[73] D O Lyon, "The Relation of Quickness of Learning to Retentiveness," *Archives of Psychology*, Vol 5, No 34, 1915

and free from the sampling error found in the earlier studies [74]

The number of cases above 60 years of age pleading exemption, usually on the ground of reading difficulty, was so great that all papers of persons above this age were discarded The age range of the sampling on which the results of Table XXVIII are based is from 11 to 60 years, the total number of cases being 765

In order to make feasible a comparison of achievement on the three tests, *sigma* scores were computed by the McCall *T* method (Chapter IX) Smoothed scale score medians are shown in Table XXVIII for the three tests at various age levels

In an attempt to find some plausible explanation of the rela-

TABLE XXVIII

RELATION OF AGE TO VISUAL MEMORY SCORES

Test A		Test B		Test C	
Age	Median	Age	Median	Age	Median
11 9	39 3	11 8	34 8		
12 8	45 4	12 6	38 5	12 8	42 2
13 5	48 4	13 3	42 8	13 6	42 5
14 4	49 1	14 4	46 1	14 4	45 3
15 4	49 4	15 4	48 0	15 5	47 5
16 5	49 7	16 6	49 1	16 4	46 5
17 4	50 0	17 3	50 6	17 5	47 4
19 1	51 8	19 0	51 2	18 9	50 1
20 4	52 4	20 5	51 8	20 2	50 8
23 7	51 4	23 5	54 3	23 4	50 7
28 3	50 6	28 6	52 3	28 2	48 9
32 3	49 5	32 1	48 4	32 4	48 6
37 6	50 1	36 8	47 8	37 7	49 5
42 0	50 3	42 8	48 6	42 5	49 8
46 7	47 0	48 3	46 7	46 8	47 2
51 8	42 3	52 3	44 5	50 8	42 8
55 9	35 3	55 7	40 6		

[74] H E Jones, "Psychological Studies of Motion Pictures II Observation and Recall as a Function of Age," *University of California Publications in Psychology*, 1928, Vol 3, pp 225–243

tionship between age and visual memory, as reported in Table XXVIII, Conrad and Jones administered *Tests A* or *B* together with the Army Alpha intelligence test to a second sampling [75] The representativeness of this sampling was checked against the United States Census data for the state in which the investigation was made, and was found to be fairly satisfactory It was found, as noted in Chapter X, that intelligence test performance also declined with age, and seemed to explain the decline in learning scores

A well-conceived experiment conducted by Ruch has shed further light upon the problem at hand [76] He sought to test the hypothesis that the deficit incident to old age is a function of decreased plasticity

For the testing of this hypothesis the following five learning tasks were provided

1 *Direct-vision pursuit rotor* In learning to follow the rotor, manually, the subject made use of established eye-hand co-ordinations

2 *Mirror-vision rotor* In learning to follow the rotor, the gyrations of which were observed in a mirror, the subject was required to reorganize pre-existing eye-hand co-ordination patterns

3 *Paired-associates* The subject learned logically related pairs of words, presented by the paired-associates method This task was designed as a test of learning of a type that enabled the subject to utilize existing habit patterns and to strengthen associations already partially formed

4 *Nonsense equations* The subject learned nonsense equations, as $E \times Z = G$, or $A \times M = B$ Presumably, this task is somewhat neutral with respect to interference or facilitation from existing habits

5 *Interference learning* This, like 3 and 4, is a task in verbal learning, but unlike them in that it is designed to give interference, since it requires the learning of false products, as

[75] H S Conrad and H E Jones, "Psychological Studies of Motion Pictures III Fidelity of Report as a Measure of Adult Intelligence," *University of California Publications in Psychology*, 1929, Vol 3, pp 245–276

[76] F L Ruch, "The Differentiative Effects of Age upon Human Learning," *Journal of General Psychology*, 1934, Vol 11, pp 261–286

$3 \times 5 = 25$, $1 \times 1 = 3$, and $5 \times 5 = 11$, in opposition to known correct ones. The results are shown in Table XXIX.

If it be admitted that the five learning tasks selected are adequate to the testing of the hypothesis in question, and such an admission is a reasonable one, and if the three age samplings

TABLE XXIX

RELATIONSHIP BETWEEN AGE AND LEARNING ACHIEVEMENT ON FIVE TASKS

Task	Age Groups		
	12-17	34-59	60-82
1 Direct-vision rotor	2857	2805	2392
2 Mirror-vision rotor	772	740	406
3 Paired-associates	135	124	112
4 Nonsense equations	79	63	38
5 Interference learning	106	76	49

are equally representative of persons of their time of life, and if equality of effort, co-operation, and the like be assumed, it may be said that Ruch's hypothesis is justified by his experimental results. The experimenter felt that good co-operation was realized from all subjects. The circumstances under which the subjects were selected (children and their parents and grandparents were used) would seem to have created a condition favorable to the securing of adequate samples.

It should be added that increasing age, after maturity, is not without compensation. There are two factors in general that go to determine a person's ability to learn, his intelligence and his past learning, fund of knowledge, etc. in the area in question. Thus it follows that in the area of his own profession a man's growth in competence which attends the active prosecution in his field may compensate to such a degree for his decline in test intelligence that he may outmatch a younger man in the learning of new facts and techniques in this field. It would seem to be that while a man of 50 or 60 is less proficient in learning in general, this loss in proficiency does not apply to his field of specialization.

A second problem concerns the relationship between age and learning achievement with test intelligence held constant If a significant relationship is still obtained, this would mean that some factor other than intelligence is operative, assuming that intelligence is adequately appraised

The relationship between age and learning achievement, with test intelligence constant, may be investigated by the method of partial correlation Upon the basis of ideal data Thorndike furnishes the following calculations

$r12\,3 = -04$, in which
r = correlation coefficient
1 = age (20 to 54 years)
2 = learning scores
3 = test intelligence

and in which $r12 = -50$, $r13 = -60$, $r23 = 80$ These coefficients are reasonable estimates made upon the basis of empirical data from various sources In this illustration the correlation between age (20 to 54) and learning achievement is -04, when test intelligence is partialed out [77] Thorndike has applied the partial correlation formula to some of his own experimental data, with a like result

In conclusion, it may be said that the data presented above suggest that learning achievement declines very little, if at all, for the age ranges under consideration when test intelligence is held constant Another way of stating the matter is that persons of different ages but of like *M A* are approximately equal in general learning ability What is usually meant, of course, when the question of age and learning ability is raised is, How, for example, do persons of 20 in general compare with those of 60 in general? To which the reply, The latter are inferior is indicated But if we are comparing men of 20 with men of 60 of like *M A*, we should expect them to score equally well in learning experiments in general, bearing in mind, of course, that each is not equally representative of his time of life [78]

[77] E L Thorndike, *et al*, *Adult Learning*, Appendix VI New York The Macmillan Co, 1928

[78] *Cf* F L Ruch, "Adult Learning," *Psychological Bulletin*, 1933,

VARIABILITY IN PERFORMANCE WITHIN THE SAME INDIVIDUALS

Organic factors The majority of factors usually treated under this caption have no great significance for learning in school The work of the school nurse is amply justified as a public service, but can scarcely be defended from a scholastic point of view by existing experimental data Similarly, dental examinations, the free luncheon for the underprivileged, tests of visual acuity, as well as tonsil inspection are, as a general thing, justified by the public services rendered rather than by experimentally derived evidence that the pupils learn more as a result The finding that caffeine has a stimulating effect scarcely justifies the introduction of the coffeepot in the classroom Nevertheless, a brief statement of the principal conclusions regarding these factors is made with the thought that the teacher should have some information about them

(1) *Loss of sleep* The results of several published investigations on the effect of loss of sleep justify three general conclusions First, subjects who have gone 24 or 48 hours, or even longer, without sleep can, and in the laboratory usually do, perform as well as they do under normal conditions of sleep [79] Second, work performed as a sequel to such periods of insomnia is of such a degree of disagreeableness that unless there is special inducement, as co-operation in laboratory experiments and the stimulus of a sporting event, subjects normally desist from it When experiments have been concluded in the forenoon, college students participating in them have found the urge to sleep stronger than that to attend classes during the remainder of the day Third, in laboratory experiments in which subjects have shown an ability to achieve normally under

Vol 30, pp 387–414 (A review of the literature) G S Snoddy, "Learning and Stability," *Journal of Applied Psychology*, 1926, Vol 10, pp 1–36 H Sorenson, "Adult Ages as a Factor in Learning," *Journal of Educational Psychology*, 1930, Vol 21, pp 451–459 R L Thorndike and G H Gallup, 'Verbal Intelligence of the American Adult," *Journal of General Psychology*, 1944, Vol 30, pp 75–85

[79] E S and F R Robinson, "Effects of Loss of Sleep II," *Journal of Experimental Psychology*, 1922, Vol 5, pp 93–100

conditions of insomnia it has been found that the cost to them in terms of energy expenditure is greater than normal [80]

(2) *Drugs* Three drugs, tobacco, caffeine, and alcohol, are in sufficient usage to warrant a brief discussion of them here The form of the drug obtained from tobacco depends to some extent upon the manner in which the product is used Nicotine, a powerful drug found in tobacco decomposes, at least for the most part, in the process of burning, resulting in the drug *pyridine*, less powerful by far than nicotine, about one-twentieth as strong, according to one writer At any rate, the brown, tar-like substance which collects in the shanks of pipes and on the fingers of cigarette addicts is not nicotine

Smoking has two very definite effects, the production of an increase in heart rate and in hand tremor A fair generalization with respect to its effect upon learning and most forms of work is that it is negligible, neither aiding nor hindering a great deal, at least for the majority of persons In some, it is said to produce a feeling of chronic fatigue

Caffeine, as found for example in coffee and coca cola, occupies a unique position in that it produces a rise in efficiency without there following an after-period of depression With large doses, 4 or 5 grains, the beneficial effects have been observed to last three or four hours Caffeine differs from opium and similar drugs which produce a temporary rise in efficiency followed by a longer and more profound period of depression

From the standpoint of efficiency the score stands against alcohol If the quantity taken is sufficient to have any effect, it is detrimental This result holds for motor co-ordination and manual work quite as much as for intellectual work [81]

(3) *Sensory defects, diseased tonsils, and malnutrition*

[80] D A Laird, "What It Costs to Lose Sleep," *Industrial Psychology*, 1926, Vol 1, pp 694 ff G L Freeman, "Compensatory Re-enforcements of Muscular Tension Subsequent to Sleep Loss," *Journal of Experimental Psychology*, 1932, Vol 15, pp 267–283

[81] H L Hollingworth, "The Influence of Caffeine on Mental and Motor Efficiency," *Archives of Psychology*, 1912, Vol 3, No 22 H L Hollingworth, 'The Influence of Alcohol,' *Journal of Abnormal and Social Psychology*, 1923–24, Vol 18, pp 204–237 and 311–333 C L Hull, "The Influence of Tobacco Smoking on Mental and Motor Efficiency," *Psychological Monographs*, 1924, Vol 33, No 3, Whole No 150

Rather extensive surveys of public school populations have found almost 25 per cent to possess less than normal vision Upon somewhat less extensive samplings it is found that from 10 to 20 per cent of the public school children are slightly defective in hearing, with 2 or 3 per cent being more seriously impaired There is some indication that the percentage of children with impaired hearing is greater among the scholastically inferior classes of the school population than among the normal and superior classes This in itself is not taken to mean that such defects are *per se* conducive to an inferior quality of work It is known that the principal source of such impairment in children is infection of the middle ear The proportion of hard-of-hearing should therefore be greater among those who do not receive adequate medical and hygienic care, namely those of low economic status The correspondence between inferior school work and the incidence of auditory defects may well be coincidental

In the case of visual defects, where data have been accumulated in some quantity, there is little evidence, aside from isolated cases, of any substantial change in academic achievement incident to correction Were schools run at top efficiency in the sense that every pupil exerted himself to the utmost, perhaps a sensory defect would be a material handicap and its correction would tell in improved quality of work *Students do not necessarily learn more when learning is made easier for them,* they may merely study less

It is admitted that there are instances in which the removal of diseased tonsils and adenoids has led to improved accomplishment in school This should not be expected as a typical outcome When the samplings have been adequate, both as to size and method of selection, little relationship has been observed between the removal of diseased tonsils and improvement of school work

Low, negative correlations have been obtained between nutritional status and excellence of school work This, however, may well be spurious At least one investigation in which malnourished children were placed upon a carefully prescribed

diet and kept on it for a period of three or four years failed to find any material change in academic achievement [82]

Fatigue Diminution in efficiency as a result of continuous work is one index of fatigue, and, from a psychological point of view, the most practical The research in fatigue with which the writer is familiar has been conducted in connection with "work phenomena" rather than with learning In work experiments the subjects are practiced until they show no further improvement, that is, brought to a practice level, or the results of learning are controlled through some experimental method Unless learning is eliminated, subjects may show an increment rather than a decrement with continued practice, that is, the effects of learning may obscure the effects of fatigue

(1) *Mental fatigue* The recognition of a separate category *mental fatigue* is an arbitrary matter, the legitimacy of which depends upon the usefulness of the concept As much may be said of mental work There seems to be no advantage in reserving the term *mental fatigue* for the designation of those physiological aspects of fatigue that are consequent to mental work, because mental work is not different systematically from other work Mental fatigue induced by mental work is not different from mental fatigue induced by manual or muscular work If there is any justification for setting up mental fatigue as a special category it is because it designates a kind of fatigue different from physiological fatigue Perhaps the term *subjective fatigue* might be preferable to mental fatigue Dodge has employed the terms *relative fatigue* and *pseudo fatigue* as designations of the same phenomenon Any term that distinguishes what is popularly called fatigue from physiological fatigue, by which is meant exhaustion, will do

[82] L M Terman and J C Almack, *The Hygiene of the School Child* Boston Houghton Mifflin Co, 1929 R L Chambers, "Changes in Achievement Following the Removal of Certain Physical Defects in Elementary School Pupils," *Doctor's Thesis* University of Pennsylvania, 1931 A I Gates, "The Nature and Educational Significance of Physical Status and of Mental, Physiological, Social, and Emotional Maturity," *Journal of Educational Psychology*, 1924, Vol 15, pp 329–358 D G Paterson, *Physique and Intellect* New York D Appleton-Century Co, 1930

With continued application, a task, be it golf or useful labor, reading Tolstoy or writing a scientific report, loses its appeal "An animal would seem likely to discontinue or decrease mental work because continuing it annoys him rather than because some inner fund of impulsion, which might be likened to physical potential energy, was running low Work without rest becomes less satisfying (1) by losing the zest of novelty, (2) by producing ennui, a certain intellectual nausea, sensory pains and even headache, and (3) by imposing certain deprivations — for instance, from physical exercise, social intercourse, or sleep' [83] To the same purpose Dodge writes, "Within physiological limits, all fatigue decrement in the results of work is relative to the intensity of the stimulus In any complex of competing tendencies the relatively greater fatigue of one tendency will tend to eliminate it from competition in favor of the less fatigued tendencies Relative fatigue is not exhaustion, but prevents it" [84]

The consequences of such factors as novelty and interest, inherent in the task, and those extraneous to it, as the character of the rewards and other circumstances under which the work is done, are so tremendous in ordinary daily affairs as to make by comparison the depletion of physical energy a relatively unimportant matter Through protracted prosecution one tires of a task though it be ever so attractive at the outset Moreover, one tires of a task which he just manages to tolerate much more quickly than of one which is initially performed with zest If the name *fatigue* be applied to such a state of affairs, it should not be understood to be physiological in the sense of exhaustion Zestful work probably taxes the body more per minute than does listless work, yet the former resists a decrement longer than does the latter That such fatigue is not due to the depletion of available energy is shown by the enthusiasm with which a worker may without rest enter upon

[83] E L Thorndike, *Educational Psychology*, Vol 3, p 122 New York Teachers College, Columbia University, 1914

[84] R Dodge, "The Laws of Relative Fatigue," *Psychological Review*, 1917, Vol 24, pp 89–113 See also A G Bills, "Fatigue, Oscillations, and Blocks," *Journal of Experimental Psychology*, 1935, Vol 18, pp 562–573

a new task, when he has tired of the old one, as when pupils, who at the end of a school day appear to have no energy left, may engage in games, such that will require a greater outlay in 30 minutes than a whole day of school work It is also well known that a rendering of a few happy phrases after hours of writing, the making of a cogent analysis of some problem, or any other circumstance that brings renewed interest, enables the worker to prosecute his task with fresh vigor, such that it often seems that he were only beginning

Indeed, mental fatigue, as the term is here used, may be thought of as a protective device The disagreeable qualities of fatigue induce the organism to desist from work well in advance of the incurrence of injury to tissue However, so much of the work that human beings are required to do in a complex society is so devoid of intrinsic interest that it may well seem that mental fatigue is an incumbrance rather than a biological asset

As measured in foot pounds or by some chemical method, as oxygen consumption, carbon dioxide exhalation, it would probably be found that pupils do little more work, if any, in school than out In the classroom the problem of fatigue reduces pretty largely to one of interest In this respect it is well to note that a change in work is often equivalent, or nearly so, to a rest Fatigue does transfer, although the amount of transference is proportional to the degree of similarity between the tasks with respect to which it is studied [85] A classic in the field of mental fatigue is the investigation of Arai [86]

Atmospheric condition Poor ventilation has two important effects from a psychological standpoint, reduction in output and discomfort to the worker Alleviation except by chance depends upon a knowledge of the causes of the symptoms

[85] A G Bills and W McTeer, "Transfer of Fatigue and Identical Elements, *Journal of Experimental Psychology*, 1932, Vol 15, pp 23–36

[86] T Arai, "Mental Fatigue," *Teachers College, Columbia University, Contributions to Education*, No 54, 1912

See also T R Garth, "Mental Fatigue During Continuous Exercise of a Single Function," *Archives of Psychology*, 1918, Vol 6, Whole No 41 This investigation may be of particular interest to students of education in view of the fact that the task was a school function and the subjects, grade school pupils

There appears to be a fairly general popular belief that the effects are owing to the depletion of oxygen and the excessive accumulation of carbon dioxide This is not the case

The atmosphere normally contains about 21 per cent of oxygen, under standard conditions, and about 03 per cent of carbon dioxide The oxygen content of a poorly ventilated school room or factory at the end of a work day is still about 19 per cent By the use of an oxygen chamber in which the oxygen content was systematically varied, Lowson found that no marked effects upon efficiency of work were evidenced until a reduction of approximately 50 per cent of the normal was effected, that is reduced from about 22 per cent to 11 per cent In a poorly ventilated work room the carbon dioxide content increases by the end of the day from about 03 to about 3 per cent [87] According to Poffenberger this figure must be increased to about 2 4 per cent to produce any very noticeable effect [88]

Further evidence that the effects of poor ventilation are not due to the chemical content of the air was brought forward in 1923, by the New York State Ventilation Commission The investigators, Thorndike, McCall, and others so contrived breathing tubes that the workers in a factory could breathe fresh, outside air This expediency did not lessen the symptoms On the other hand the symptoms did not appear when the men, working under ideal atmospheric conditions, were required, by means of breathing tubes, to breathe the stale air from the "sweat shop"

From the standpoint of efficiency the problem is essentially one of keeping the body at a suitable temperature This cannot be controlled adequately by the simple expediency of keeping the room or factory at a specified temperature Relative humidity and circulation are attendant variables When relative humidity is excessively high or when the atmosphere is stagnant the liberation of heat incident to work and the normal functioning of the body is interfered with, owing to the

[87] J P Lowson, "The Effects of Deprivation of Oxygen upon Mental Processes," *British Journal of Psychology*, 1923, Vol 13, pp 417–434

[88] A T Poffenberger, *Applied Psychology*, p 166 New York D Appleton-Century Co , 1927

film of moisture that envelops the body Heat is given off by radiation, evaporation, and conduction, processes that take place most readily when relative humidity is not excessively high and when the atmosphere is circulating Incidentally, in temperatures that are too low for comfort excessive relative humidity and circulation tend to increase the discomfort as they further the processes of removing heat from the body

MENTAL ABILITY AND FATIGABLENESS

An investigation reported by Winch in 1911 has some bearing on this problem, although it was designed for another purpose, namely that of determining the effect of time of day upon efficiency [89] His findings provide inferential evidence of a difference in susceptibility to fatigue as between the younger and older children Age and mental age were co-variables Garth obtained some evidence of a greater fatigableness upon the part of slow workers than upon the part of fast workers in column addition These of his data are likewise incidental to his main experiment [90]

Recently, Valentiner has compared the decrement obtained for a group of dull children, mean *I Q* 65, with that for an average group, mean *I Q* 100, the two groups being matched in *C A* On her tests, number cancellation, letter cancellation, and color-naming, the dull group showed a much larger decrement than did the normal group Thus the evidence at hand, while not abundant, suggests that dull, slow, inaccurate workers fatigue more quickly than bright, fast, proficient workers [91]

[89] W H Winch, "Mental Fatigue in Day School Children, as Measured by Arithmetic Reasoning," *British Journal of Psychology*, 1911, Vol. 4, pp 315–341

[90] T R Garth, "Mental Fatigue during Continuous Exercise of a Single Function," *Archives of Psychology*, 1918, Vol 26, Whole No 41

[91] H L Valentiner, "The Comparative Fatigability of Normal and Mentally Deficient Children,' *Journal of Abnormal and Social Psychology*, 1941, Vol 36, pp 51–61 *Cf* A G Bills, *The Psychology of Efficiency* New York Harper and Brothers, publishers, 1943

CHAPTER XIII

CONDITIONS OF LEARNING METHODS AND MATERIALS

METHOD OF PRESENTATION

Sensory mode of presentation Sensory mode of presenting learning material was one of the first problems of educational psychology to emerge The first volume of the *Psychological Review* contains an article on the relative efficacy of three methods of presentation [1] names of objects presented orally, names of objects presented visually, and the objects themselves presented visually In the same volume Munsterberg makes comparisons between visual, auditory, and visual-auditory presentation of colors and numbers, as measured by the errors made in reconstructing the lists [2] Lay compared the visual and auditory modes of teaching spelling [3] Smedley investigated the visual, auditory, vocimotor methods of presentation and various combinations of the three methods by the memory-span method [4] Pohlmann compared the various methods on meaningful words and nonsense syllables [5] The foregoing investigations and many others of this same type failed to establish any definite superiority of one method over another

(1) *The doctrine of image types* The educational problem of sensory mode of presentation grew out of the doctrine of image types. A person employing a predominance of visual imagery was said to be visually minded or eye-minded, one employing auditory imagery predominantly, ear-minded, and so on Moreover, it was generally held that visually minded

[1] E A Kirkpatrick, "An Experimental Study of Memory," *Psychological Review*, 1894, Vol 1, pp 602–609

[2] H Munsterberg, "Memory," *Psychological Review*, 1894, Vol 1, pp 34–38

[3] W A Lay, cited by F J O'Brien, "A Qualitative Investigation of the Effect of Mode of Presentation upon the Process of Learning," *American Journal of Psychology*, 1921, Vol 32, pp 249–283

[4] F W Smedley, cited by O'Brien, *ibid*

[5] A Pohlmann, cited by O'Brien, *ibid*

persons, as determined by the relatively greater richness of their visual imagery, could learn most readily when material is presented by visual means The auditory type was alleged to learn with greatest facility when material was presented to the ear This teaching was based upon the assumption that since learning involves the making of associative connections, it should be easier to make these connections in that sense modality in which there exists the greatest power of revival of past experience There seems to have been the idea also that recall could be best effected by the medium of the dominant imagery Thus, the learning of material presented to the sense department in which there exists the best imagery would, by this supposition, have the greatest utility Granting the validity of the type doctrine, it follows that the best image modality yields the most faithful recall However, it does not follow that material should necessarily be presented visually to the visual type, or by ear to the auditory type Thus Lay took note that in spelling, nearly all subjects utilized visual imagery in recall, regardless of the sense to which the words were presented Abbott also observed that subjects may make easy transference from one modality to another, as is seen in the fact that materials presented to the ear, for example, may be recalled in terms of visual imagery, rather than auditory [6]

Thus Abbott's observation brought into question the validity of the educational teaching that each learner should receive his education through the sense corresponding to his best image modality Also, Horn called attention to the practical difficulties teachers would encounter in trying to determine the dominant type of imagery of each child, even if the image-type doctrine was valid [7] Anyone who is familiar with the vast amount of knowledge about imagery that the teacher would re-

[6] E E Abbott, "On the Analysis of the Factor of Recall in the Learning Process," *Psychological Monographs*, 1909, Vol 11, Whole No 44, pp 159–177

[7] E Horn, "Principles of Method in Teaching Spelling as Derived from Scientific Investigation," *Fourth Report of the Committee on Economy of Time in Education*, Eighteenth Yearbook, Part II, pp 52–77, National Society for the Study of Education Bloomington, Ill Public School Publishing Co , 1919

quire and with the epistemological pitfalls encountered in the study of imagery must be convinced of the reasonableness of his comment Earlier, Meumann had seen in image types a possibility of putting education upon a scientific footing [8]

The question of image types need not, however, obscure the practical aspect of the issue If learning varies with the sensory mode of presentation, that fact can be ascertained empirically and the results utilized in teaching This problem has not been investigated with any great degree of thoroughness Particu-

TABLE XXX

IMMEDIATE RECALL IN PERCENTAGE AFTER THREE PRESENTATIONS OF THREE KINDS OF MATERIAL PRESENTED BY FOUR METHODS

Material	Visual	Auditory	V-A	V-A-M
Nouns	64 1	68 6	72 1	69 7
Syllables	32 4	40 8	40 1	43 4
Numbers	48 0	58 0	50 5	51 3

larly is definitive information lacking about the extent of individual differences with respect to mode of presentation

In 1912, Henmon employed on three kinds of material — concrete nouns, 2-place numbers, and nonsense syllables — four methods of presentation visual, auditory, visual-auditory, and visual-auditory-motor In visual presentation, the subjects read the material as presented, in auditory presentation the experimenter read the units aloud, in visual-auditory, the subjects were allowed to see the units as they were read by the experimenter, in visual-auditory-motor, the subjects read them aloud [9] The results are given in abridged form in Table XXX The most marked feature is the consistent inferiority of the visual method

Woody compared the auditory and the auditory-vocimotor

[8] E Meumann, *The Psychology of Learning* New York D Appleton-Century Co , 1913 (Third edition Translation by J W Baird)

[9] V A C Henmon, "The Relation between Mode of Presentation and Retention," *Psychological Review,* 1912, Vol 19, pp 79–96

methods of presentation in the memorization of poems He obtained no important differences [10] Worcester found the number of trials required to memorize selections of poetry by visual and auditory presentation to be equal [11]

The literature contains descriptions of more than a score of investigations bearing upon this problem In commenting upon the publications that had appeared up to the time of his own work, Henmon wrote "The results of the experiments are not in accord" This remark is as appropriate today as in 1912

This situation is not to be regarded as settling the matter *Problems in learning cannot be solved by averaging the results of a number of separate experiments* One experiment may be said to serve as a check on another experiment only in the event the conditions of the two are equivalent There are, of course, various ways of rationalizing a problem for purposes of an experimental attack, and one experiment may serve as a check upon the generality of the conclusions drawn from another experiment even though the conditions of the two experiments be different The practice of displaying results of an array of experiments in a table with findings *pro* and *con* signified by plus and minus signs, or any similar method of treating experiments *en masse*, is questionable Results of different experiments may be added and subtracted only if the experiments are identical in all important conditions

In the absence of valid experimental data to the contrary, it is suggested that there is no good reason to suppose there should be any very important systematic differences in the relative effectiveness of different sensory modes of presentation, except perhaps those dictated by habits of work Learning appears to be accomplished by the making of responses One form of sensory excitation should be as satisfactory for purposes of eliciting the putatively requisite responses as another Academic learning is, or should be, featured by understanding and

[10] C Woody, "The Effectiveness of Oral Versus Silent Reading in the Initial Memorization of Poems," *Journal of Educational Psychology*, 1922, Vol 13, pp 477–483

[11] D A Worcester, "Memory by Visual and Auditory Presentation," *Journal of Educational Psychology*, 1925, Vol 16, pp 18–27

meaningful organization The central processes loom large in learning These considerations, in addition to the equivocal character of the experimental results, make it unlikely that there are in general any fundamental differences in the results of different sensory modes of presentation However, differences in interest value and differences in development of mechanical means of presenting material, for example the perfection of the motion picture, may make one method more available than another [12]

(2) *Listening and reading* Young has compared four methods of presenting connected text materials, in classroom situations, using as subjects elementary school pupils of Grades 4 to 6, 400 or more per grade [13] Fifteen different selections of material, ranging in length from 350 to 800 words, were presented by the following methods

A Teacher read aloud to pupils
B Teacher read aloud, pupils followed by reading silently
C Pupils read silently at own individual rate
D Pupils read silently for a length of time equal to that required by their teachers to read orally

Learning was assessed by means of objective tests administered immediately after the presentation of the material Four groups, equated on the Gates Reading Test, were formed in each grade Both the order of presenting the selections and the order of the methods of presentation were cross-checked or counterbalanced

Reliability coefficients of the tests ranged from 61 to 88 Correlations of about 60 were obtained between the scores earned when the materials were read by the teachers and those earned when read by the pupils themselves Comparisons of

[12] *Cf* F R Elliott, 'Memory for Visual, Auditory, and Visual-auditory Material," *Archives of Psychology*, 1936, Vol 29, Whole No 199 H N DeWick, "The Relative Recall Effectiveness of Visual and Auditory Presentation of Advertising Material," *Journal of Applied Psychology*, 1935, Vol 19, pp 245–264

[13] W E Young, "The Relation of Reading Comprehension and Retention to Hearing Comprehension and Retention," *Doctor's Thesis* State University of Iowa, 1930

the effectiveness of methods *A*, *C*, and *D*, for which complete data were obtained, may be made from Table XXXI

Young concludes that the differences are small and usually lacking in statistical significance It is worth noting, however, that the method of auditory presentation proved to be some-

TABLE XXXI

SCORES IN PER CENT OF MAXIMUM FOR THREE METHODS OF PRESENTATION

Material	Grade	Listening	Reading (own rate)	Reading (for time equal to listening time)
Natural Science	4	33	25	29
" "	5	41	35	41
" "	6	46	41	44
Poetry	4	23	20	22
"	5	36	32	31
"	6	37	31	34
Hero	4	27	23	24
"	5	40	35	37
"	6	49	44	
Industrial	4	21	18	18
"	5	32	24	32
"	6	40	37	39

what superior to the other two with marked regularity Further data are given presently in connection with the discussion of the lecture method Young's results are in accord with those of earlier investigations conducted by Russell [14] and Erickson and King [15]

The results of Goldstein's investigation, described more fully

[14] R D Russell, 'The Relative Effectiveness of Presenting Verbal Material Visually and Orally as Measured by the Amount of Recall," *Doctor's Thesis* State University of Iowa, 1923

[15] C I Erickson and I King, "A Comparison of Visual and Oral Presentation of Lessons in the Case of Pupils from the Third to the Ninth Grades," *School and Society*, 1917, Vol 6, pp 146–148

in Chapter V, corroborate those of Young with respect to the correlation between reading and listening For adult subjects ranging in age from 18 to 65 years, he obtained a coefficient of 78 between reading comprehension and listening comprehension [16] The data of Larsen and Feder are in accord with those of Young and Goldstein [17] Goldstein's results also are in accord, in general, with Young's in showing some superiority of listening over reading This superiority diminished, however, with increasing difficulty of the material

The lecture method of instruction In general, there are two methods of attacking this problem One method compares learning from lectures with learning by some other method, for example, reading, when the content of the materials of learning is the same This method lends itself to reasonably rigid control and, when put in this form, the problem is in effect continuous with that discussed under *sensory mode of presentation* and *reading and listening* A second method yields less readily to experimental control, but attacks a more significant aspect of the general problem, namely that of comparing the lecture method with other methods of conducting classes, such as class discussion, the use of conferences, and the like, in which the content of the material is admittedly different Does some one method make feasible a better choice of content or a superior method of treating it? After all, we are not so much concerned about how the various methods of teaching compare when all conditions, except the mode of presentation, are equivalent, as we are in the variations that the different methods permit and the comparative effectiveness of these variations

Investigations by Greene [18] and by Corey [19] are similar in

[16] H Goldstein, 'Reading and Listening Comprehensions at Various Controlled Rates," *Teachers College, Columbia University, Contributions to Education,* No 821, 1940

[17] R P Larsen and D D Feder, "Common and Differential Factors in Reading and Hearing Comprehension," *Journal of Educational Psychology,* 1940, Vol 31, pp 241–252

[18] E B Greene, "The Relative Effectiveness of Lecture and Individual Reading as Methods of College Teaching," *Genetic Psychology Monographs,* 1928, Vol 4, pp 457–563

[19] S M Corey, "Learning from Lectures vs Learning from Readings," *Journal of Educational Psychology,* 1934, Vol 25, pp 459–470

design to those described above and need not be commented upon further at present It seems doubtful if any generally useful statement can be made about the relative effectiveness of the lecture method and the various forms of class discussion, since so much depends upon the lecturer and the quality of the discussions, as well as upon the subject or course of study [20] There is nothing to be found in the published research or in common sense to dissuade a teacher from using the method he likes best

Effectiveness of instruction is not determined so much by *what the teacher does, as by what he leads the pupils to do*, think, read, and so on

On visual aids As a psychological problem the question of the value of visual aids is not continuous with that of sensory mode of presentation The content of films, slides, and still pictures is ordinarily not capable of being presented orally in anything like equivalent form Indeed one of the chief values of such visual media of instruction lies in the fact that they make possible the presentation of content not so readily presentable by verbal means There is also a large human-interest factor in good films and still pictures Some of the experimentally obtained advantages in motion pictures and sound-picture films may have been due in part to novelty, which with regular use might tend to wear off

The problem may well be more one of physics than of psychology The mechanical means of presenting material visually is at present in a relatively high state of development, in comparison with other media [21]

[20] *Cf* R B Spence, "Lecture and Class Discussion in Teaching Educational Psychology," *Journal of Educational Psychology*, 1928, Vol 19, pp 454–462 H H Remmers, "Learning, Effort, and Attitudes as Affected by Three Methods of Instruction in Elementary Psychology," *Studies in Higher Education*, XXI, Purdue University, 1933, Vol 33, No 6 D H Cook, Two Experiments in Learning Educational Statistics," *Journal of Educational Research*, 1932–33, Vol 26, pp 674–678

[21] Selected references C F Hoban, C F Hoban, Jr, and S B Zisman, *Visualizing the Curriculum* New York The Cordon Co, 1937 V C Arnspiger, *Measuring the Effectiveness of Sound Pictures as Teaching Aids* New York Bureau of Publications, Teachers College, Columbia University, No 565, 1933 F L Devereux, *The Educational Talking Picture* Chicago University of Chicago Press, 1933

The effectiveness of one or more presentations Naturally, a general answer cannot be given to the question How effective is one or *n* presentations? Much, indeed nearly everything, will depend upon the learner, the material, and the rigorousness of the tests employed in assessing the learning A pupil may be made to appear to learn much or little according as the test is easy or difficult

While it is impossible to say how much is learned as a result of one or more presentations, it is possible, of course, to determine the percentage of correct answers made on a criterion test The usefulness of this determination will depend upon the adequacy of the tests It is possible to secure a fair amount of agreement as to the facts and meanings pupils should get, ideally, and to ascertain by practical measures how closely the pupils approximate this ideal

Yoakam addressed himself to this problem in a systematic investigation of the effectiveness of a single reading and of two consecutive readings of various types of material common to the elementary school [22] The subjects, pupils in Grades 4 to 8, were engaged in reading prose selections ranging in length from 110 to 1900 words The materials were selected from geography, history, nature study, economics, and language The principal guiding factor in their selection was that of securing materials that were common to the elementary grades The effect of the readings was assessed by objective tests The test questions allegedly covered the important ideas contained in the reading material As evidence of the extent to which such results are influenced by the character of the material and the nature of the tests, is the fact that his averages (in percentage of correct responses) varied from 15 5 to 78 Yoakam's results on the effectiveness of a single reading are summarized by him as follows

> The effect of a single reading of content material varies with the individuals, but on the average it is less than half of the total ideas in the article read and it often falls to a third or less

[22] G A Yoakam, "The Effects of a Single Reading," *University of Iowa Studies in Education*, 1924, Vol 2, No 7 See also G A Yoakam, *Reading and Study* New York The Macmillan Co , 1928

Individuals vary so much in their abilities that it is not safe to conclude that there are not some people who can read an article once and practically remember its entire contents There are a fortunate few who would be as efficient after a single reading as others might be after severe study

Incidental results of earlier investigations by Mead,[23] Pintner,[24] and Waldo [25] are in accord with those of Yoakam, as are the results of Young, cited above Perhaps it should be mentioned that if the test is rigorous enough to discriminate among the ablest pupils, the showing of the student of average ability must necessarily be mediocre This result is produced in part by experimental arrangement But these differences must exist or else the test could not reveal them

There can be little doubt that the typical student learns a comparatively small amount of what he reads, hears, or otherwise perceives, or that the poor student learns little indeed

Yoakam compared the effect of two consecutive readings with the effect of but a single reading Two equated groups of pupils, Grades 7 and 8, were formed for this comparison Those of one group read the material a single time, those of the other group were given two consecutive readings The former achieved a median percentage score of 30 5, the latter, a score of 32 8, on immediate recall

Yoakam's results regarding the effect of a second reading, imposed immediately after the first, are confirmed by the findings of Good, published a year later [26]

An investigation of the effectiveness of a second exhibition of a sound-picture educational film has been conducted by Loats This condition of his investigation was designed to parallel the

[23] C D Mead, "Silent Versus Oral Reading with One Hundred Sixth-grade Children," *Journal of Educational Psychology*, 1915, Vol 6, pp 345–348

[24] R Pintner, "Oral and Silent Reading of Fourth-grade Pupils," *Journal of Educational Psychology*, 1913, Vol 4, pp 333–337

[25] K D Waldo, "Tests in Reading in Sycamore Schools," *Elementary School Journal*, 1915, Vol 15, pp 251–268

[26] C V Good, "The Effect of a Single Reading *Versus* Two Readings of a Given Body of Material," *Journal of Educational Method*, 1926, Vol 5, pp 325–329

conditions of Yoakam's and Good's experiments One group of eighth grade pupils observed in a single presentation the film *Territorial Expansion of the United States from 1783 to 1853*, and eight days afterward took an objective test over the content of the film A like group observed it in two consecutive presentations and took the test eight days later The mean score earned by the first group was 13 25, by the second group, 13 62 [27]

The foregoing results do not justify a second presentation of material like the first immediately afterward Generalization beyond these conditions is not warranted Doubtless there are ways of increasing the efficiency of educational films, over and above a single presentation The same is true of reading A second presentation like the first without any intervening preparation does not seem to be among them There are so many arguments against repetitive practice wherever understanding, generalizing, and concept-forming are involved as to make it highly probable that our attention should not be directed toward increasing the effectiveness of a second or third reading but toward a more fruitful line of attack, such as that suggested presently in connection with *extensive reading*

One method that has been worked rather systematically in reading, and which was also employed by Loats, is the securing of a test response immediately after a presentation, even without a subsequent second presentation Without exception, to the writer's knowledge, this method has proved, by substantial and significant amounts, to be superior to a second presentation This procedure is discussed further in a later context

Are our schools or our natures at fault? It is easy enough to criticize our schools There is no season of the year in which the pastime is not indulged in Pupils do not learn enough, it is said, and, by implication, they could learn a great deal more Pupils learn and remember very little of their lessons The facts of everyday observation substantiate this, as do psychological experiments like those recounted above Is this something that teachers should be ashamed of? Is it something to

[27] H A Loats, "The Effect of One and Two Showings of Educational Films," *Master's Thesis* State University of Iowa, 1942

be remedied? Let it be said that it is much easier to give assent than to produce the remedy

We can only make use of the mental resources we have, those supplied by nature and our previous training And, incidentally, nature never "intended" that our brains be put to such use, for brains are much older than schools, and have probably not changed materially since formal instruction began In a sense we have occasion to marvel at the fact that pupils learn so much of the world, past and present, and in so short a time, with brains that were wrought in a different – vastly different – environment from that which prevails in the classroom

Our learning apparatus is imperfect, that of some, of course, being vastly superior to that of others, but of all, imperfect It would be much fairer to appraise the pupil's accomplishment not by how much of some maximum amount he learns, but by comparing his learning with that of the rest of us A pupil reads his lesson and can reproduce but a small part of it That is the fault of the school! A citizen sees an accident, reads a book, or attends the theater, and afterward can give comparatively little by way of an intelligent account That is as it should be!

It is a fact that comparatively little of all the vast and colorful kaleidoscopy that passes over our senses makes any lasting impression in us We see and hear but little of that which is visible and audible, and most of that which we do see and hear is not remembered

If we can produce a small increase in amount learned per hour, and the difference between the poorest and best method of learning per effective unit of time is not numerically great, the aggregate effect would, at the end of a school career, be tremendously important

Prediction is a hazardous business, but this we know, that learning has ever been slow, tedious, and imperfect There is reason to believe that it will so remain Even when the process is completely understood, human curiosity shall have been satisfied, but it does not follow that marvels of educational engineering will necessarily result Knowledge of circulation does not make the normal heart work better With all of our

knowledge of physiology, we require as long to digest food as did Priam and Achilles To be sure, we have very useful knowledge about the digestive properties of foods, and in the same sense we know something about the "digestive properties of lessons" to the learning of which pupils are put This knowledge is in both instances very useful Our digestion is no better than that of the heroes of the *Iliad* because our stomachs are no better But what about our brains and eyes and ears, are they any better?

Learning differs from digestion in one important respect, namely that it is subject to voluntary regulation Within broad limits one can learn or not as he chooses In a very narrow sense, a person can eat or not as he chooses, except that nature, by means of hunger and appetite, sees to it that he will make the choice No such provision is made for learning There is much that education and psychology can do about learning, and much still to be learned about the process However, by reason of limits set by our natures, it is idle wishing to expect some Copernican discovery that will enable things we see and hear, and otherwise observe, to make an impression upon us twice as great, that will enable us to remember twice as much of what we learn, or that will double our understanding of things It is easy to demonstrate to teachers that their pupils do not learn any great percentage of what they study The reflection that this is not a condition peculiar to pupils, but to nature herself, may be of some satisfaction to teachers

Constructive activities The problem of sensory mode of presentation had its origin in psychology The problem of constructive activities grew out of the classroom, although its development has not been uninfluenced by psychology by any means The problem of significant learning — learning that has significance to the learner — has plagued education since Locke's day, at least Without doubt we are today farther removed from the memoriter and catechetical methods than at any time in our history Locke took occasion to deride the schoolmasters of his day for their insistence upon excessive memory work Our own schools were pretty much dominated by this kind of instruction down to the end of the last century,

instruction which was all the worse because the pupils so little understood what they had thus laboriously learned Slade supplies an instructive example of this kind of learning In a certain class in geography (1882) the teacher asked the questions, as was typical of that day, and "the pupils gave, with considerable gusto, the answers given in the book" To the question "Which is the most populous of the western states" the pupils replied without hesitation, "Ohio is the most populous of the western states" When asked by Slade what the word *populous* meant there was confusion and embarrassment A similar result was obtained when the pupils were asked to explain "heights commanding Washington," after the sentence "It was feared the rebels would obtain possession of the heights commanding Washington" had been rendered in a history class [28] Here we have illustrations of the learning of pat answers in response to stock questions, with little regard to the understanding of what is learned This is the catechetical method at its worst

The foregoing method has probably never been without its critics Locke's invectives are mentioned in Chapter XI Herbart's elaboration of Locke was a specific against this form of teaching, although many of his followers fell into the evils of formalism almost as inimical to significant learning as the evils he sought to correct Rousseau's (1712–1778) "back to nature" movement seems to have been motivated by the desire to correct the evils of mere verbalism inherent in the memoriter method

Pestalozzi's (1746–1827) child garden seems to have been a wiser approach The latter's method of taking the school to the garden was the forerunner of the method of bringing the "garden" to the school, namely the object-lesson method, as launched by E A Sheldon at the Oswego Normal School about 1860 [29] While this method had the worthy aim of avoiding the meaninglessness of mere verbalistic learning it proved to be not

[28] J P Slade, "Country Schools," *Proceedings,* National Educational Association, 1882, pp 21–23

[29] N H Dearborn, "The Oswego Movement in American Education," *Teachers College, Columbia University, Contributions to Education,* No 183 1925

a cure-all Without previous knowledge objects may be about as meaningless as words, although no one would doubt there is educational value in seeing and examining objects that are being studied On the practical side, the object-lesson method, and the use of maps, modeling, and sand tables fell into evil ways also Critics complained that much of the instruction based upon their use lacked significance to the learners The method was overdone Rather than being used as an aid to teaching it became in many schools an end Some critic observed that did they wish to teach a pupil to come out of the rain "they must have a watering pot and a rag-baby to show the effect of the shower" [30]

Perhaps one of the most successful procedures for infusing learning with significance has been the constructive activities While this method bears considerable similarity to the object-lesson method and the map-making and modeling of the latter part of the last century and to an extent had its origin in these methods, it differs from them in certain important ways It is constructive rather than imitative It is directive in the sense that it guides the learning activities of the pupils The activities, while they may appear to the pupils to be the ends that justify the means, are really the articulating centers of a great deal of work and study The activity is thus a means of making learning meaningful and of giving it a purpose It is also a very important means of socializing the work of the classroom

The constructive activity movement was given form and direction by Parker and Dewey around the beginning of the present century It became rather well established in American schools by the nineteen-twenties This movement is discussed in some detail in Chapter XVI Suffice it to say for the present that it easily stands as the most significant movement in education in our times While it has found its greatest expression in the elementary school, some of its elements are found in the high school, notably in connection with the laboratory method of teaching the sciences, and the project method

[30] From F A Anderson, "A Description and Evaluation of the Constructive Activities Used in Teaching the Social Studies from 1880 to 1930," *Doctor's Dissertation* State University of Iowa, 1934

GUIDED LEARNING

In a sense all learning is guided by its motive-incentive conditions The import of Chapter XI as well as that of the foregoing pages gives the question of guidance special significance in education The mental processes do not work in the mechanical fashion of a camera They are selective and therefore imperfect With equal conditions of distance and illumination the camera gets everything within its scope, warts as well as dimples The mind is biased It is also severely limited, in comparison with mechanical recording devices, by the fact that it reacts to but one thing at a time As is seen in Chapter XI, learning (probably) does not transpire in the absence of reenforcement or confirming reactions, and as also seen, these are conditioned by the motives or sets that are operative From these considerations it follows that direction in learning should be of the greatest consequence

Laboratory investigations in guidance Over a period of years various students of Carr conducted a number of systematic investigations on guidance in learning These were summarized by him in 1930 [31] *In these experiments we may find an interesting and valuable lesson in educational psychology* The majority of them were conducted in maze learning, some with human subjects, some with rats In all, the subjects were guided, in ways to be described presently, during varying numbers of trials In these trial-and-error situations the subjects were, during the guided trials, prevented from making errors, correct practice was enforced In one experiment, that of Alonzo, rats were restrained from entering the blind alleys by means of a leash [32] To many teachers the spectacle of a man "driving" harnessed rats through a maze will be viewed as the acme of educational futility, and second only to that of a blindfolded adult fumbling with a stylus in a maze composed of alleys ¼ inch deep and ¼ inch wide milled in a block of brass

[31] H A Carr, "Teaching and Learning," *Journal of Genetic Psychology*, 1930, Vol 37, pp 189–218

[32] A S Alonzo, "The Influence of Manual Guidance upon Maze Learning," *Journal of Comparative Psychology*, 1926, Vol 6, pp 143–157.

The teacher is likely to misunderstand the psychologist's purpose The results of those experiments are of the greatest consequence in psychology and in teaching, the significance of which we shall indicate following a brief description of some of the experiments The psychologist is interested in gaining an understanding of the learning process, not in providing imitable models of teaching

The following are some of the forms of guidance that were investigated *manual*, in which the experimenter guides the hand of the subject along the true pathway, *mechanical*, in which for a given number of trials the blind alleys were blocked off by barriers, and *verbal*, in which the subject was told to go straight ahead, to turn right, and so on The effectiveness of guidance varied with a number of conditions, particularly with the amount and the point at which it was introduced Under some conditions guided practice proved to be more effective than a corresponding amount of unguided practice, though generally it proved to be less effective, and in some instances was found to be positively detrimental The most effective results were secured by introducing a small number of guided trials in the initial stages of practice In general the relative effectiveness of guided trials decreased with their number

In maze learning it is easy to understand how guidance introduced at or toward the beginning of practice should prove to be superior to an equal amount of unguided practice, because of the peculiar problem of orientation In a typical maze experiment the subject has no knowledge of the pattern, the general direction of the true pathway, or the position of the goal Guidance in the early trials serves the purpose of orientation

However, the great significance of the experiments of this class lies not so much in the conditions in which guidance proved to be effective as in the conditions in which it proved ineffective This work of Carr and his students, done for the most part in the early nineteen-twenties, represents one of the first experimental attacks upon the role of frequency in learning In terms of sheer frequency, enforced correct practice — which is what this form of guidance amounts to — should be

the most suitable condition of learning The fact that guided practices after the initial orienting function had been served, or large amounts of guided practice at any point, proved to be comparatively ineffective served to show that sheer repetition is not an effective condition of learning This is demonstrated very well in an investigation by Waters Those of his subjects, a control group, who were given no guidance learned a maze in an average of 37 5 trials and in 2191 seconds A group that was given 40 guided trials in advance of unguided practice required an average (including the guided practice) of 67 7 trials and 2234 seconds A group that received 80 guided trials in advance of unguided practice required a total of 103 4 trials and 2833 seconds His subjects were college students [33] The results of an investigation by Gates and Taylor on various forms of guidance in teaching handwriting show the same general tendency [34]

Guided learning in school The effectiveness of most forms of guidance in learning in school cannot be inferred from the results of the aforementioned experiments, because the conditions are not equivalent, or even highly similar Guidance in the former sense resembles in some respects the passive practice provided in the experiments of Thorndike and others in putting animals through acts by manual manipulation of the animal or certain of its limbs [35] In contrast, the kind of guidance to be discussed in the following pages does not make for passivity of practice but for directed activity

(1) *The assignment* The problem-solving character of learning and thinking should be fully appreciated In a sense all mental effort starts with and is directed by a problem Even in the simplest aspects of perception, one does not just perceive something, but perceives it in relation to some act of adjustment, some problem The same is true of reflective thinking

[33] R H Waters, The Influence of Large Amounts of Manual Guidance upon Human Maze Learning," *Journal of General Psychology*, 1930, Vol 4, pp 213–227

[34] A I Gates and G A Taylor, 'The Acquisition of Motor Control in Writing by Preschool Children," *Teachers College Record*, 1923, Vol 24, pp 459–468

[35] E L Thorndike, *Animal Intelligence, Experimental Studies* New York The Macmillan Co , 1911

The problem is the reason for thinking, and the course of thought is directed by the nature of the problem as perceived or felt *Learning does not begin without a problem,* and the nature of the learning act is directed by the nature of the problem, even when it is no more specific than the general problem of getting one's lessons But if it does not become more specific than this, the pupil may experience difficulty in concentration and complain about not knowing how to study

There is no mystery about studying It is noteworthy that we do not feel called upon to instruct the youth in how to read an account of a football game, or teach him how to learn to construct a model airplane Given appropriate instructions about a project, he knows how to learn their contents and to follow their directions We do not exhort him to concentrate, to have a purpose, to assume the same posture each time he reads the instructions or to go to the same place, or have a definite time for reading them, or to spend a certain portion of the time reading and a certain portion in applying what he has read All such instruction seems unimportant beside the fact that he has a job to do and is interested in doing it He is reading and studying for a purpose *He has a problem*

The essence of helping a pupil to learn is to help him find a problem he is interested in Nearly all of the directives on how to study tell the student he should have a purpose when he studies Unfortunately, this is in about the same class of helpfulness as telling him he should have a good *I Q* or good ancestry There is not a great deal he can do about it Likewise we do not help him very much by telling him to try again, to work hard, to concentrate Perhaps one person has about as good a "concentrator" as another Of course, some pupils concentrate on their lessons much more effectively than others do, but the greatest intellectual dabbler may exhibit remarkable powers of concentration with respect to his fishing gear, or display marvelous diligence in designing and constructing something that strikes his fancy

A student who is having difficulty with his lessons should ask his teacher for a better assignment This will mean that the teacher will have to do different things for different students

Many students require specific direction, others may be so mature as to be able to sense a problem and go to work upon it with a minimum of direction In fact such self-reliance is the ultimate goal for all students They should in time learn to depend upon themselves as they must do in later life But the immature pupil lacks sufficient background to enable him to sense problems, and, moreover, in later life one is not called upon to read and study assigned material to meet the requirements of a course of study Thus learning in school differs from learning in later life in one important respect in school one studies because he is told to do so, later, he *studies when he has a problem that he wishes to investigate* Then his reading and studying are directed by his goals and purposes They should be directed by no less in school

The task of helping a pupil find a suitable problem is no easy matter The problem must be worth while from the standpoint of instruction, as well as interesting This task often amounts to leading the pupil to accept a problem as being worth his while The problems and goals to be of full educational value should be the pupil's own This does not mean that he should originate them, although it is probably desirable that he have a share in their development and organization, but he must accept them as being worth while to him

When the pupil becomes interested in working out a problem learning becomes a means to an end Then, learning is directed, as it should be, by the motive-incentive conditions of the pupil The problem should be appropriate to the student's ability and such that he can appraise his work It need not be in itself one of intrinsic interest, but the carrying out of the project should satisfy some fundamental interest In all this the teacher has the basic purpose of providing important learning experience In carrying out the project the pupil gains this experience, but the guiding purpose, the end, as perceived by him is not learning The end guides the learning activities — makes them meaningful and purposeful The pupil can appraise his own work to the extent that it contributes or fails to contribute to his guiding purpose [36]

[36] The unit plan gives the teacher an advantageous start in planning

A good assignment should not only make clear what is to be done, but should also provide tasks suitable to the individual abilities of the pupils Its execution should not entail monotonous busywork for the able student nor tax unduly the poor student A student is not challenged by a task that is too difficult any more than he is by one that is too easy Moreover, the sense of failure and futility that must oppress a student as he butts his head against a task that does not yield to his efforts is stifling to any intellectual spontaneity he may have

Perhaps, we should be on guard lest projects become too individualistic There is some danger that the contract plan, for example, and its variations, may lead to too much individualism in learning Provision for individual differences need not mean a separate problem for each student When the nature of the work is such as to permit it, it seems more desirable to engage a class in working at a problem as a social unit The part that a particular student may contribute to the working out of the problem should depend upon his talent But the class should, ideally, have a single goal, and should co-operate in the spirit of mutual helpfulness toward its realization Extreme individualism is inimical to the fostering of a sense of belonging, so important to the pupil's sense of security, as discussed in Chapter VIII

There are various ways of setting a socialized goal for a class, and there is more than one *good* way of doing so, but it is suggested that the co-operative-assignment technique has certain natural advantages Before students are ready to undertake the execution of an assignment, and even before they are ready to consider specific assignments, there should supervene a period of general discussion the purpose of which should

a project From the standpoint of giving direction to learning, the unit plan is one of the great contributions to teaching method There are several excellent treatments of this topic to be found in textbooks in educational methodology, notably J G Umstattd, *Secondary School Teaching*, Chapters VI–IX Boston Ginn & Co , 1937 R O Billett, *Fundamentals of Secondary-school Teaching*, Chapters XVI–XVIII Boston Houghton Mifflin Co , 1940 N L Bossing, *Progressive Methods of Teaching in Secondary Schools*, Chapters VII–VIII Boston Houghton Mifflin Co , 1942 W H Burton, *The Guidance of Learning Activities* New York D Appleton-Century Co , 1944

be to delineate and vitalize the problem or unit of work When the problem is thus defined, the students will know what they are about, and when vitalized or made important they should experience a sense of security and satisfaction as they work at it

There seems to be a good chance that the pupils will, in the first place, have greater interest in a task in the planning of which they have had a share than in a teacher-imposed task A second and more important advantage in the co-operative assignment is the socialization of the classroom Pupils like to talk and work together In the third place, the co-operative planning of an assignment gives the teacher a better vantage in determining when the pupils are ready to begin work on a problem As Horn has said, a pupil is ready to go to work on a problem when, and only when, he can state it clearly Thus, as the students talk over a problem, the teacher is in a position to judge when they have the objectives sufficiently well in mind to begin work

When an assignment is properly made the question of the proper balance between *teaching facts* and *teaching pupils to think* is largely outmoded, as is seen in Chapter VI A pupil should be expected to learn such facts — and only such facts — as are necessary to a mature consideration and understanding of the issue to which the facts relate, and should be expected to learn them only for the purpose of gaining such understanding When this is done there is no serious question of knowing which facts to learn There is no danger of learning too many facts, or facts that do not apply When one starts with a *problem* the danger is rather that there will not be enough time or enough resources for the learning of all the facts necessary to an adequate consideration of the problem in question

(2) *The examination* Another way in which we guide the learning and thinking of our pupils — although one that is not always thought of as means of guidance — is the examination The type of thing for which the student is rewarded or held to account necessarily influences the way in which he prepares his lessons It is not at all uncommon for us to lose sight completely of our noble and well-defined objectives when we go to

make out our examinations There are but few courses of study in which are not found the objectives *appreciation* and *critical thinking* However, when it comes time to bring the pupil to a reckoning on his work we have reason to suspect that the teacher as test maker scarcely knows the teacher as curriculum-maker All the worthy objectives seem to be lost sight of When students are repeatedly examined, as by a poor type of true-false tests, on knowledge of incidental, and often unimportant, detail, it is to be expected that the full usefulness of the examination as a directive device is not being realized The making of good objective examinations is hard work and certainly is not to be accomplished by copying sentences out of the textbook and inserting the word *not* at appropriate places in about one-half of the statements

There are few techniques at the teacher's command that give him so much control over the study activities of his pupils as does the examination The examination is not merely a testing device It is an important directive device When this of its features is fully appreciated, its use for this purpose may be considerably facilitated

There are those who regard the examination at best as a sort of necessary evil They say it encourages undesirable study habits, that it does not place the emphasis properly, that students should be motivated to get an education instead of working for marks This sounds like fuzzy thinking Earning good marks and getting an education should be one and the same thing If a student who works for marks misses an education in the process, the result is, of course, deplorable But this is not inherent in marks If a student can earn a good mark only by making progress in obtaining an education – making progress in the direction of all the objectives of the courses of study, then working for marks would at least seem to be harmless

There are, however, some objections to the unbridled use of marks as motivational devices, even when the marks are based upon good examinations Good examinations can be abused Perhaps, the most serious objection is that marks are highly individualistic and largely devoid of socializing value For a number of reasons it is important that the social spirit be kept

alive and fostered in our classrooms There should prevail a spirit of mutual helpfulness While wholesome rivalry is not incompatible with the spirit of group welfare, intense individualism and rivalry are incompatible with it An arrangement for giving a class a mark as well as, or rather than, individuals might help to preserve a social spirit

(3) *The recitation* The recitation should not be regarded as a period for hearing the pupil recite, though the history of the term itself suggests that The thought that all the learning and thinking have already taken place and that the purpose of the recitation is merely to allow the pupil to give an account of himself has no place in progressive education

Much is to be said for the socialized recitation in which the teacher and pupils converse with each other about the problems under investigation However, by all means it is the substance and not merely the form that counts We should shun the idea that there are but two kinds of recitation on the one hand, socialized, and, on the other, catechetical — the asking of sterile questions and the receiving of pat answers memorized from books No doubt there are socialized recitations — in which pupils talk and argue glibly about things of which they know little or nothing — that are just as sterile as the recitations of the schoolmasters of old The minimum essential of a good recitation is that some first-class thinking and learning transpire Everything depends upon the kind of questions raised and the quality of answers expected and demanded It does not necessarily follow that a good class is taught merely because there is a lot of discussion All depends upon what is discussed and how well

Other things being equal, there appears to be some advantage in the socialized recitation It provides for interlearning, that is, learning one from another — one of the most natural and effective forms of learning If the English teacher could teach English with the ease with which his pupils pick up expressions from each other he would think the millennium had arrived The socialized recitation capitalizes on the natural social tendencies of pupils to talk and interchange ideas It can be made the means of cultivating many desirable social

qualities, such as respect for the opinions of others, restraint in taking a position and stating an opinion, co-operation and sharing in the working out of problems, and skill in getting on with others who hold different views But whatever the form of the recitation, the teacher's role is the same that of maintaining high standards, of making sure the problems are worthwhile, and that the students have valid reasons for their statements [37]

The recitation requires the highest type of pupil participation It should be understood that pupils are to be disciplined, just as in the co-operative assignment In both instances some pupils talk when they have nothing to say They argue about things they know little or nothing about They listen not to learn but to determine the precise moment the speaker stops so that they may not lose an instant in getting in This is not good teaching, but the cultivation of bad intellectual habits There should of course be a tolerant attitude on the part of the teacher and pupils, but this tolerance should not extend to giving social approval to unbridled talking Well-controlled discussions provide good training Pupils should learn to differ with each other gracefully but should be restrained from making extravagant claims, from drawing conclusions without investigating the facts The spirit of discussion should be that of arriving at the best possible answer, not that of winning an argument The teacher's role in managing group discussions so that these benefits are realized is enormous and usually makes the difference between realizing them or not *A contribution is not necessarily made to the education of pupils merely because they discuss or plan something* Such a contribution is made when they discuss *well,* or plan *well,* something that is *worthwhile,* and carry it through to successful termination Students, and for that matter teachers, do not necessarily learn because they practice something We learn by practice just about what we practice When practice is bad, learning is bad We learn the right things by practice when we practice something well And that is as true of student participation in school management as it is of the co-operative assignment or

[37] *Cf* Bossing, *op cit*, Chapter XV

the socialized recitation It should not be understood that the pupil has concluded his contribution to a discussion when he has made a single statement or asked a single question He should be held responsible for continued participation, but one does not have to talk in order to participate in a recitation He may do so by listening and thinking

(4) *Directing learning by the use of questions* Prominent in the methodology of the last 75 years have been the Herbartian *steps* These, as the reader will recall, have been known as *preparation, presentation, association, systematization,* and *application,* or other names carrying the same import, more or less The term *assimilation* has been a happy substitute for association Some writers have substituted organization for systematization It, is not, of course, supposed that these steps follow each other as separate and distinct units in the mind of the pupil Assimilation and organization do not, for example, await the learning of all the facts Presentation has actually meant a sort of overview Certainly the pupil does not and should not wait until all the facts are learned before he begins to think about what they mean or begins to relate them to his existing knowledge and concepts Different systematists have advocated different method of implementing assimilation — more intense study and thought — following the brief overview (presentation) The McMurrys placed chief emphasis upon conversation or class discussion Morrison has advocated as a supplementary device the use of questions and problems as presented in mimeographed guide sheets

There has now appeared some bit of research pertaining to the use of questions in the guidance of learning One of the most systematic is that of Washburne [88] He studied the effect of questions on the learning of facts and on the making of generalizations, and the effects of placing the questions at various positions, as at the beginning of the story, at the end, and at the beginning and end of paragraphs The effect of questions on the learning of those facts and understandings actually en-

[88] J N Washburne, "The Use of Questions in Social Science Material," *Journal of Educational Psychology,* 1929, Vol 20, pp 321–359

compassed by the questions was also compared with their effect on the learning of those not so encompassed

Table XXXII shows the principal results The plus sign signifies an advantage, the minus sign, a disadvantage, as compared with a control group which did not use the questions

TABLE XXXII

EFFECT OF STUDY QUESTIONS, INTRODUCED AT FOUR POSITIONS, ON TEST RESPONSES TO FIVE KINDS OF ITEMS, IN PERCENTAGE

Kind of Test Questions	Position of Questions			
	At Beginning of Story	At Beginning of Paragraphs	At End of Paragraphs	At End of Story
1 — Factual, unrelated to study questions	—1	—12	—10	—9
2 — Factual, connected with study questions	+14	+10	+9	+7
3 — Generalization, not directly related to study questions	+24	+15	+15	—14
4 — Generalizations related to factual study questions	+24	+24	+11	+3
5 — Generalization, related to generalization study questions	+37	+41	+22	+15

Legend These percentages are approximations taken, by inspection, from a column diagram

The best placement of questions is at the beginning of the story, the poorest, at the end It was found that children with high *E Q*'s were more affected by questions and their placement than children of low *E Q*'s Other investigators have used questions in various ways [39] On the whole they have proved their worth

[39] *Cf* A T Jersild, "Examination as an Aid to Learning," *Journal of Educational Psychology*, 1929, Vol 20, pp 602–609 S J Williamson,

(5) *Work-type reading* The work-type reading program, at its best, envisages a great deal more than guidance in reading a lesson In a sense it may be thought of as guidance in mental development It looks to the inculcation of effective study habits Such matters as the formulation and delineation of problems, acquaintance with sources of knowledge and skill in their use, respect for the dictionary, the use of tables, graphs, globes, maps, and atlases, are not left to incidental learning but are made the object of specific instruction In this program students are taught to read critically, to challenge the author's statements, and to evaluate the importance of the content [40] It recognizes that reading at its best involves reflective thinking But work-type reading is envisaged as a means of directing learning

In his manual for reading instruction Bennett [41] provides a number of exercises toward securing the development of "the four major silent reading abilities," to wit (1) locating information, (2) comprehending what is read, (3) organizing, summarizing, etc what is read, and (4) remembering what is read For example, under *organizing ability*, etc specific exercises are provided for the development of the following, among others "ability to find the key sentence in a paragraph," "ability to give the main thought in a paragraph," "ability to rearrange information into logical groups," "ability to take notes for a particular purpose," "ability to summarize a paragraph,"

"Retroactive Inhibition as a Function of Similarity in Meaning between Primary and Interpolated Materials," *Master's Thesis* State University of Iowa, 1942 Eleanor Holmes, "Reading Guided by Questions Versus Careful Reading and Re-reading without Questions," *School Review*, 1931, Vol 39, pp 361–371 C O Mathews, "Comparison of Methods of Study for Immediate and Delayed Recall," *Journal of Educational Psychology*, 1938, Vol 29, pp 101–106

[40] *Cf* W S Gray, "The Nature and Organization of Basic Instruction in Reading," pp 65–131, *The Teaching of Reading a Second Report Thirty-sixth Yearbook*, Part I, National Society for the Study of Education Bloomington, Ill Public School Publishing Co, 1937 E Horn, *et al*, *Teacher's Manual to Progress in Reading* Boston Ginn and Co, 1940 P G McKee, *Reading and Literature in the Elementary School* Boston Houghton Mifflin Co, 1934

[41] H K Bennett, *A Plan for Directed Study through Work-type Reading* Des Moines, Iowa Department of Public Instruction, 1939

"ability to explain a problem by summarizing reasons," "ability to select from an assignment the important points," "ability to organize material around a definite problem" [42]

The following, taken from a unit prepared by MacDonald for a sixth grade class, will illustrate one kind of work-type reading procedure [43] Under "Approach to the Unit" we find examining reference material, reading for background, reading and interpreting a graph, locating data, and under "Raising the Problem," organizing thought into questions, stating the questions, reorganizing the questions The class was divided into two groups, according to ability, and each group given appropriate basic references, accompanied by an objective study sheet The following are excerpts from the study sheet furnished one of the groups

The treatment for tuberculosis was discovered by _____
Where does the germ that causes tuberculosis grow? _____

What is the purpose of the third paragraph on pages 223–24?
a To tell that Indians hunted and lived in wigwams
b To prove that sunlight and fresh air are a protection against tuberculosis
c To tell about dusty trades

SYMBOLICAL PRACTICE

One does symbolical practice when he engages in the recall of material previously learned This may be secured as a specific practice exercise, as in rehearsing a poem previously learned or in recalling and organizing the content of an assignment previously read, or it may be secured as a means to some other end, as in organizing material for a lecture A student engages in symbolical practice as he thinks over and attempts to organize what he has read or heard in a lecture Except in memorization such practice to be effective need not be in the

[42] *Ibid*, pp 71–72
[43] I MacDonald, "Reading to Solve a Hygiene Problem in Grade VI," *Newer Practices in Reading in the Elementary School* Seventeenth Yearbook, National Elementary Principal, 1938, pp 379–386

same form as the original Any ideas that have the same meaning as the original will suffice

Recall as a method of study Perhaps there are but few teachers with any sort of psychological sophistication who have not heard of Gates' experiment on recitation as a factor in memorization Unfortunately, so much cannot be said of the number of teachers who have made any systematic, planned, and continued use of this highly effective and economical form of practice Indeed many teachers have probably lectured their pupils upon its advantages, but if we may judge from pupil activity in the study hall and library, we may guess that the information has not done much good The experimental literature bearing upon symbolical practice is rather extensive, the earliest work dating back to the first decade of this century [44]

In his experiment Gates sought to obtain an answer to the following question [45] What are the relative values of learning by reading as compared to learning by reading and recitation in the normal schoolroom situation? His subjects were elementary school pupils, the learning material consisted of nonsense syllables and biographical sketches Five different selections of these two kinds of material were learned by each subject, the percentage of the total learning time in which recall was permitted being different for each list

Under one condition the pupils spent all the learning time in reading and rereading the material Under the other four conditions they spent 80, 60, 40, and 20 per cent of the time in reading and 20, 40, 60, and 80 per cent respectively in recall and reading For example, in Condition 2 the pupils devoted the first 80 per cent of the study period to reading and rereading, and the last 20 per cent to recall and self-prompting When recall was allowed, the pupils were instructed to recite as much as possible and to glance quickly at the copy when in

[44] D Katzaroff, "Le Rôle de la Recitation comme Facteur de la Memorisation," *Archives de Psychologie*, 1908, Vol 7, pp 225–258 E E Abbott, "On the Analysis of the Factor of Recall in the Learning Process," *Psychological Monographs*, 1909, Vol 11, pp 159–177

[45] A I Gates, "Recitation as a Factor in Memorizing," *Archives of Psychology*, 1917, Vol 6, Whole No 40

need of prompting The latter point should be especially noted, because experiments in recall in which prompting has not been permitted are not strictly comparable with Gates's experiment

TABLE XXXIII

THE EFFECTIVENESS OF READING IN COMPARISON WITH VARYING AMOUNTS OF PROMPTED RECALL IN MEMORIZING NONSENSE SYLLABLES, IN PER CENT OF 100

	Per Cent Reading				
Grade	100	80	60	40	20
8	65 40	92 23	99 69	105 45	137 26
6	59 13	88 35	101 34	112 57	136 61
4	63 42	80 53	108 05	113 75	134 42
1	107 64	105 90	107 65	97 22	81 59

The results as shown in Tables XXXIII and XXXIV are relative to 100 taken as the average score earned by all five methods On delayed recall tests, introduced approximately four hours after the termination of the learning exercise, all percentages in favor of recall were raised The values presented in Tables XXXIII and XXXIV are based upon immediate recall scores

TABLE XXXIV

THE EFFECTIVENESS OF READING IN COMPARISON WITH VARYING AMOUNTS OF PROMPTED RECALL IN MEMORIZING SENSE MATERIAL, IN PER CENT OF 100

	Per Cent Reading				
Grade	100	80	60	40	20
8	87 78	94 62	104 98	105 45	106 80
6	89 21	97 58	106 19	104 36	104 77
5	80 42	95 15	103 75	108 86	104 57
4	86 34	99 94	96 69	111 17	104 13
3	74 78	89 29	96 54	121 93	113 12

Jones obtained significant results in favor of recall by college students in learning pairs of nouns presented visually and auditorially [46] For example, under one condition the mean delayed recall score, in per cent, was 41 6 for the lists in which recall was levied, and 29 9 for the lists presented without recall [47]

The efficacy of recall in learning is amply demonstrated by research Its use in some amount should prove to be valuable in all kinds of learning in which it can be used However the effectiveness of recall as compared with the effectiveness of rereading, relistening, or some other mode of impression should, logically, vary with a number of conditions, particularly, the amount of recall, the stage in learning at which it is introduced, the amount of material that has been forgotten at the time recall is introduced, and the method of inducing it

(1) *Stage at which recall is introduced* Skaggs, Grossman, Krueger and Krueger have found that in memorization recall was relatively ineffective when introduced near the beginning of practice – within the first three or four trials [48] The writer and Freeburne have corroborated their finding on this point and have also found that the effectiveness of recall for purposes of review (of material previously learned to a criterion of one perfect repetition) decreases with the passage of time, i,e , varies with the amount that can be recalled [49]

(2) *Suggested reasons for the value of recall* Gates suggests that one reason for the economy of recitation as a form of practice is that it allows the learner to practice the material in the

[46] H E Jones, "Experimental Studies of College Teaching," *Archives of Psychology*, 1923, Vol 10, Whole No 68

[47] *Cf* G Pal, "Influence of the Reproducing Process in Memorization," *Indian Journal of Psychology*, 1926, Vol 1, pp 39–44 E B Skaggs, "The Relative Value of Grouped and Interspersed Recitation," *Journal of Experimental Psychology*, 1920, Vol 3, pp 424–446 E L Thorndike, "Repetition *versus* Recall in Memorizing Vocabularies," *Journal of Educational Psychology*, 1914, Vol 5, pp 596–597 W C Trow, "Recall *vs* Repetition in the Learning of Rote and Meaningful Material," *American Journal of Psychology*, 1928, Vol 40, pp 112–116

[48] E B Skaggs, S Grossman, L Krueger, and W C F Krueger, "Further Studies of the Reading-recitation Process in Learning," *Archives of Psychology*, 1930, Vol 18, No 114

[49] J B Stroud and M Freeburne, "Symbolical Practice," *Journal of Educational Psychology*, 1942, Vol 33, pp 65–71

manner in which it is to be recalled Several other reasons have been proposed by various writers One is that recall tends to energize the learning activity, whereas practice without recall tends to be more passive In successful recall there is greater opportunity for the operation of *effect-re-enforcement-confirming responses* than in the more passive form of reading and listening When the conditions of learning provide two or more consecutive trials, the interspersing of recall has some directive effect on the learner's efforts during the subsequent presentation trial, inasmuch as he is made aware of what he does not know

Recall is also quite economical from the standpoint of time The student will find a few minutes devoted to recall after the reading of an assignment or listening to a lecture quite valuable

(3) *Implementing recall* If a condition of learning is sufficiently important, in terms of the difference its utilization makes, to justify its recommendation, provision should be made for its use in the instructional program in a deliberate and systematic manner The securing of thoroughgoing, effective recall should be a recognized part of teaching procedure Simply to invite students to make use of this important expediency, no matter how pressing the invitation, is at best to have it ineffectually done, and more often, done not at all One excellent method, subvocal review, is scarcely available as a classroom procedure because it is lacking in the necessary elements of control

There is need of dependable means of inducing recall in ordinary classroom procedures, in consideration of which it should be observed that *a recognitive response functions as an act of learning* in quite the same sense that an act of recall does Recognition is a response made by the organism In no sense is it a passive reception of stimuli This response is subject to the conditions of effect, belonging, etc just as other learning responses are In a case in which *A* makes a vain attempt to recall the author of a certain book and *B* names some probable authors, and *A* recognizes one of them as being correct, *A*'s act of recognition is an act of learning, as is seen by the fact that the

probability of his being able to state the name of the author in the future is increased

Class discussion of previously prepared lessons is one method that permits of some degree of control, especially if guided by significant questions The effectiveness of this procedure will vary with the number of pupils that actually gives some active mental reaction to the questions and actively attends to the progress of the discussion Class discussion may have a number of advantages For some it is a review, for others a preview, for all, if skillfully done, it affords a means of creative thinking on important issues, but alas, for some it is little more than an opportunity to talk about things they do not know much about Purely for recall purposes class discussion is probably not the best available procedure For one thing, it is time-consuming In a class in which morale is high, a teacher might well invite his students to undertake to answer subvocally well-formulated questions An occasional "class experiment" in which the value of this kind of aided silent recall is demonstrated might prove to be effective in enlisting co-operation

Some procedure that requires the student to show evidence of recall is more satisfactory from the standpoint of control The student may be required to write short answers to well-posed questions This form of practice is uneconomical when the student is required to write very much, because of the time consumed in writing Besides, it tends to impose a burden on both the teacher and the pupils The objective test affords a desirable means of eliciting learning responses and permits the covering of a wide variety of facts and understandings in a relatively short time Incidentally, frequent and systematic use of such a procedure should also have the salutary effect of encouraging more preparation and more effective reading For this same purpose a so-called recognition test, such as the multiple-response type, is probably as effective as completion tests

As is shown in a later chapter, the recall value of a test depends upon the closeness in time to the original learning A test given within two or three days after learning has a greater effect than when given two or three weeks afterward [50]

[50] *Cf* M Bridge, "The Effect on Retention of Different Methods of

EFFECT OF EXAMINATIONS

To the psychological value of examinations assent is given without reluctance, that is, examinations put to their best use There arises from the sheer taking of an examination an actual learning effect, by which is meant an effect that accrues from responding to questions This we may infer from a knowledge of the value of recall and recognition as well as from empirical data It is probably not extravagant to say that the contribution made to the student's store of knowledge by the taking of an examination is as great, minute for minute, as any other enterprise he engages in Frequent use of the examination is not a waste of valuable school time, it is a valuable use of that time

The examination holds possibilities for motivating pupils, realization of which will depend upon the way it is used Knowledge that an examination is imminent may spur the pupil to execute neglected assignments or review them if previously completed Knowledge of attainment based upon an examination whose validity the pupil respects should, in the light of psychological data, be an important motivational force Properly used, the examination may also possess diagnostic value in that it informs the student where his strength or weakness lies

The foregoing implies more or less ideal conditions A valid method of promoting learning in school will actually promote it only in the event the students put forth as much effort as they did before the method was introduced As stated before, making learning more efficient may merely have the result of af-

Revision," *Australian Council for Educational Research, Educational Research Series*, No 28 Melbourne University Press, in association with Oxford University Press, 1934 E Eaglesham, "A Comparison of the Effects on Retention of Various Methods of Revision," *British Journal of Educational Psychology*, 1931, Vol 1, pp 204–214 C E Germane, "The Value of the Controlled Mental Summary as a Method of Studying, *School and Society*, 1920, Vol 12, pp 591–593 C E Germane, "The Value of the Corrected Summary as Compared with the Rereading of the Same Article," *The Elementary School Journal*, 1921, Vol 21, pp 461–464 A M Sones and J B Stroud, "Review, with Special Reference to Temporal Position," *Journal of Educational Psychology*, 1940, Vol 31, pp 665–676 G A Yoakam, *op cit*

forming more time for loafing Also, the examination can be demonstrated to have motivational value only in the event the pupils care what showing they make To the indifferent, knowledge of achievement is a matter of no great weight

Good teaching is difficult and even the simplest applications of psychology are hard to make The impatient teacher who is dissatisfied with small increments in teaching efficiency will continue to look for some royal road to learning and turn an ever eager ear to slogans and novel preachments The difference between a mediocre method and a very good one, if equally well applied, cannot ordinarily be demonstrated to be numerically great in the classroom where so many uncontrolled variables operate We should have learned by now that slogans, be they ever so attractive, are relatively unproductive and that the glittering promises held out to us by this camp or that are incapable of fulfillment

The following are some of the questions that have received attention from research workers

1 Does the kind of examination, for example, essay, completion, multiple-response, or true-false, affect students' study habits differently?

2 How do short, frequent examinations compare with long, infrequent ones?

3 What is the effect of the final examination?

4 Is there negative suggestion in objective examinations?

The effect of the examination set Of the foregoing questions the first is perhaps the most crucial Meyer's investigations bear upon this question [51] Each of four equated groups of college students worked under one of four examination sets, namely, true-false, multiple-choice, completion, and essay Actually, all four kinds of examinations were administered to each group, regardless of the set under which they worked The results as expressed in comparative scores are given in abridged form in Table XXXV

The only differences whose significance ratios are 3 or more are between essay and completion sets (recall) on the one hand

[51] G Meyer, "The Effect on Recall and Recognition of the Examination Set in Classroom Situations," *loc cit*, 1936, Vol 27, pp 81–99

and true-false and multiple-choice sets (recognition) on the other, the differences favoring the former

The fact that supervised study was induced and was kept constant for all groups, at least in a temporal sense, is worth noting Where supervised study is not exacted and no attempt is made to keep the amount of preparation constant for the various examination sets, it is conceivable that greater differences might be obtained in favor of recall sets If, as seems to be true, students have a general feeling that recognition tests are easier than recall tests and tend to place some reliance in their ability to guess and to decipher the right answer, it is

TABLE XXXV

EFFECT OF EXAMINATION SET ON TEST PERFORMANCE

Kind of Test Anticipated	Scores Earned on Each Kind of Test			
	True-False	Multiple-Choice	Completion	Essay
True-False	67 81	63 79	52 57	51 22
Multiple-Choice	66 26	62 82	50 92	42 86
Completion	71 61	67 76	57 40	55 61
Essay	71 23	68 83	60 40	62 34

thinkable that in normal course work they would make more preparation for essay and completion examinations than for true-false and multiple-response ones

Frequency of examinations From the standpoint of recall value there is an advantage in frequent examinations as opposed to infrequent ones, as already noted, when other things are equal However, in normal instructional situations, frequency is only one of the variables operating The effect of the test conditions upon the amount and frequency of preparation is another variable On the theoretical side, the use of frequent examinations should have the effect of inducing pupils to distribute their study more evenly

On the whole small differences have been obtained in favor of frequent examinations as opposed to infrequent ones Thus

Keys obtained a difference in score points of 12 per cent in favor of weekly as opposed to monthly examinations, his two groups responding to the same number of test questions in the aggregate However on the final examination, which followed a period of cramming and intensive preparation, the two groups achieved equally [52]

Effect of the final examination It goes without saying that any statement about the effect of the final examination is relative to the conditions with which it is compared The final examination may serve to prompt the student to make thorough, systematic review of the material of a course of study There can be no doubt that this in itself is educationally desirable Whether or not it will be realized will depend upon the rigor of the examination and the use that is made of it in appraising the pupils' achievement Cramming is to be desired if it comes as added preparation, not as a substitute for preparation There could scarcely be any doubt that there is value in the final examination when other things are equal This is not to say that there may not be other procedures that are as good or even better [53]

[52] *Cf* Sister Felicita (Gable), "The Effect of Two Contrasting Forms of Testing upon Learning," *Johns Hopkins University, Studies in Education,* No 25 Baltimore The Johns Hopkins Press, 1936 N Keys, "The Influence on Learning and Retention of Weekly as Opposed to Monthly Tests," *Journal of Educational Psychology,* 1934, Vol 25, pp 427–436 D H Kulp, "Weekly Tests for Graduate Students?," *School and Society,* 1933, Vol 38, pp 157–159 J K Little, "Results of Use of Machines for Testing and for Drill, upon Learning in Educational Psychology," *Journal of Experimental Education,* 1934, Vol 3, pp 45–49 A H Turney, "The Effect of Frequent Short Objective Tests upon the Achievement of College Students in Educational Psychology," *School and Society,* 1931, Vol 33, pp 760–762

[53] *Cf* D H Kulp, "Weekly Tests for Graduate Students?" *School and Society,* 1933, Vol 38, pp 157–159 V H Noll, "The Effect of Written Tests upon Achievement in College Classes An Experiment and a Summary of Evidence," *Journal of Educational Research,* 1939, Vol 32, pp 345–358 H H Remmers, 'Exemption from College Semester Examinations as a Condition of Learning," *Studies in Higher Education,* XXIII, Purdue University, 1933, Vol 34, No 3 T H Schutte, 'Is There Value in the Final Examination?" *Journal of Educational Research,* 1925, Vol 12, pp 204–213 I O Scott, "Stimulating Learning through the Use of the Final Examination" *Doctor's Thesis Colorado State College,* 1937 M N Thisted and H H Remmers, "The Effect of Temporal Set on Learn-

The question of negative suggestion in objective tests Several years ago some concern was expressed about the possibility of negative suggestion in objective examinations, particularly in the false items of true-false examinations There followed a small amount of research In the writer's opinion the issue is not settled This research did show that the total effect of taking true-false and other objective tests is not detrimental, but somewhat favorable But there still remains a possibility, indeed almost a certainty, that negative suggestion operates in the case of items answered wrongly, especially if the student feels positive about his answer Any erroneous statement a person makes or endorses, when he thinks it is true, makes a contribution to erroneous learning This question is in part psychological, but there is the practical educational problem of the possibility of overcoming this negative effect by returning the corrected test papers to the students for inspection [54]

Some psychological aspects of tests A test the reaction to which requires recall appears to the student to be more difficult than one which merely requires recognition, and prior to the statistical treatment of the scores it is more difficult — in the sense that students make lower scores on recall kinds than on recognition kinds when the form and content are the same This is known from the fact that the recognition threshold is considerably lower than the recall threshold Even when the recognition tests are "corrected for guessing" they yield higher numerical scores than recall tests, as Andrew and Bird show [55]

ing," *Journal of Applied Psychology*, 1932, Vol 16, pp 257–268 C W White, "The Effects of Exemptions from Semester Examinations on the Distribution of School Marks," *School Review*, 1931, Vol 39, pp 293–299 H B White, "Testing as an Aid to Learning," *Educational Administration and Supervision*, 1932, Vol 18, pp 41–46

[54] *Cf* Noel Keys, "The Influence of True-False Items on Specific Learning," *Journal of Educational Psychology*, 1934, Vol 25, pp 511–520 H H and E M Remmers, "The Negative Suggestion Effect of True-False Examination Questions," *Journal of Educational Psychology*, 1926, Vol 17, pp 52–56 C E Sproule, "Suggestion Effects of the True-False Tests," *Journal of Educational Psychology*, 1934, Vol 25, pp 281–285

[55] D M Andrew and C Bird, "A Comparison of New-type Questions Recall and Recognition," *Journal of Educational Psychology*, 1938, Vol 29, pp 175–193

The student is well aware of the comparative difficulty of the two types of tests, and although he is told this makes no difference in the grade he gets, the psychological rather than the statistical reasoning is likely to prevail, as Andrew and Bird point out

Another psychological aspect of testing is the effect of correcting true-false and multiple-response tests for guessing Although immediate interest is not in the statistical effects of this procedure, it is not amiss to suggest, briefly, what they seem to be The effect of the reliability of the scores is probably negligible, when the students resort to guessing If, however, students can be induced to omit items which they respond to only upon the basis of guesses, reliability would seem to be improved The giving of bonuses as one-fourth of a point for each 4-response item omitted may offer better inducement than the threat of subtraction Some investigators have found corrected scores to yield slightly higher validity coefficients than uncorrected ones Bird and Andrew found this not to be the case with their data [56] Moreover, correction changed the letter grade of only 6 out of 316 students

However, correction for guessing has a marked effect upon the variability of the scores in the sense that the distance in score points between the good and poor students is increased In the nature of the case, correction has the effect of lowering the scores, and, of course, the initially low scores much more than the initially high ones Whatever accrues in the way of reward and punishment from a knowledge of results should be augmented by this procedure It has also been suggested that this general lowering of scores may dissuade instructors from giving so many high grades and enable them to defend the low grades more convincingly against the complaints of the student The same situation prevails in the case of the completion test since here also the differences between the high and low scoring pupils are comparatively great Although scores in general tend to run higher on recognition tests than on com-

[56] C Bird and D M Andrew, "The Comparative Validity of New-type Questions," *Journal of Educational Psychology*, 1937, Vol 28, pp 241–258

parable recall tests, the greatest differences are found among the poorer students [57]

Too much cannot be said about the quality of test items, from the point of view either of appraising pupil accomplishment or from the standpoint of their psychological effect We cannot here enter into a discussion of test construction, but it is fitting to point out to the teacher that good examinations are difficult to construct and that proficiency requires considerable training Lindquist has presented an able treatment of this subject [58]

Although the quality of item is much more important than the form, and although some types of subject matter are more easily handled by one form than another, something is to be said for the multiple-choice form, other things being equal It creates a more favorable attitude, as compared with the true-false form, in that the student is not put in the position of accepting a statement as being true or false without qualification, but is merely asked to choose the best response of those available Care should be exercised to the end that the foils have some degree, ideally varying degrees, of plausibility There appears to be no objection to the student's arriving at the correct response by the process of elimination provided the foils are eliminated on the basis of knowledge pertinent to the field tested, but it should not be possible to eliminate them on the ground that they do not make sense

The novice runs the risk of giving away the answer by his phraseology or by grammatical and syntactical construction

[57] *Cf* W W Cook, "The Measurement of General Spelling Ability Involving Controlled Comparisons between Techniques," *University of Iowa Studies Studies in Education,* 1932, Vol 6, Whole No 6 H H Remmers, *et al*, "An Experimental Study of the Relative Difficulty of True-False, Multiple-Choice, and Incomplete-Sentence Types of Examination Questions," *Journal of Educational Psychology,* 1923, Vol 14, pp 367–372 G M Ruch and G D Stoddard, ' Comparative Reliabilities of Five Types of Objective Examinations," *Journal of Educational Psychology,* 1925, Vol 16, pp 89–103

[58] H E Hawkes, E F Lindquist, and C R Mann, *The Construction and Use of Achievement Examinations,* Chapters II–III Boston Houghton Mifflin Co , 1936 *Cf* H A Greene, A N Jorgensen, and J R Gerberich, *Measurement and Evaluation in the Elementary School,* Chapter VIII New York Longmans, Green and Co , 1942

For example, in matching exercises it is sometimes possible to decipher the correct answer simply by choosing the response that makes a complete sentence, as in the following example adapted from Lindquist [59]

1 Most normally green plants lose their color when a through their stomata, b contracts into a rounded mass, c grown in the dark, d are now extinct, e the formation of a reproductive body

Another illustration taken from the same source follows

The "Boxer Rebellion" which occurred in 1900 was
_____ a rebellion of one of the counties in Mexico in protest against high taxes being imposed upon it
_____ an attempt of the Filipinos to gain their freedom a short time after we had secured the Islands from Spain
_____ an uprising of a group of people in China known as "Boxers" who tried to rid their country of all foreigners by murdering them and taking their property

Analyses of teacher-made true-false examinations have shown that the great majority of statements containing the words *all* and *only* are false, and those containing the words *none* and *generally* are true These are but a few isolated examples of the kind of structural defects that find their way into objective tests Needless to say, items that can be answered on grounds other than those pertaining to the content of the course are not valid, and to the extent that such items are used, to that extent the various psychological values of examinations are not realized Perhaps the teacher could gain valuable insight into the way items function by having pupils state the ground on which the choice of response was made The examinations of the novice are also likely to show a lack of items capable of measuring reflective and inferential thinking, and ability to interpret and apply information

Incidentally, it is suggested that a school psychologist could add considerably to his usefulness by assisting teachers in the construction of their examinations This function takes on increasing importance when it is remembered that about two-thirds of all the examinations given in high school are teacher-made, objective examinations

[59] *Op cit*

EXTENSIVE *VERSUS* INTENSIVE STUDY

By intensive study is meant the reading, rereading, and intensive study of a textbook or some similar source, by extensive study is meant wide reading and the gathering of information from various sources The teacher must face this issue every time he makes an assignment He cannot avoid it if he tries

Some disadvantages inherent in the intensive method For a number of reasons our vote should go to the extensive method The notion of thoroughness that some teachers associate with the intensive method is laudable, but is placed in the wrong kind of company Thoroughness can be achieved in most fields, at least, only by extensive reading and study Some teachers, perhaps many, in planning their work come to the conclusion that their students will do well to learn what is in the textbook and, accordingly, assign bits of it at a time with the injunction to study it thoroughly, to read the assignment over and over

The aim of mastering the textbook is, of course, a worthy one if the textbook is good But a textbook cannot be "learned well" in the way these teachers suppose Its content cannot be mastered by reading and rereading, even if the pupil can bring himself to undertake such drudgery To become master of the content of a book, that is, to gain anything but superficial mastery, the pupil must do as the author did — read and study extensively

Reading and rereading a book does not lead to mastery The gain from a second or a third reading is usually exceedingly small, as noted previously Here we see what educational folly there is in inviting a student who complains that he did not get much out of his assignment to read it again And, in view of the range and variety of material available today on almost every subject in the curriculum we may surmise that this is our most unpardonable educational practice

It is, of course, true that all but the very exceptional students fail to learn anything like all the facts, ideas, and concepts contained in an assignment from a single reading Indeed the yield is usually considerably less than half It does not neces-

sarily follow, however, that this is a justification for having the pupils read it again This is so, first, because the gain from a second reading is so small, as a general thing, and, second, because there are better procedures

Textbooks are best used as outlines or guides rather than as the chief source of learning The writer of a textbook labors under certain serious handicaps, as noted in Chapter VI In order to serve as a sufficient book for a course of study the text must treat a variety of topics And in order to keep it from becoming so large as actually to frighten the pupil, the author must present much of the material in a highly condensed and abstract manner In order to see the significance of this let us bear in mind a point made earlier, namely that the pupil must form his own ideas and concepts These he forms in part by the help of the book and in part — and much the greater part — by the help of his background of experience It is true that the author formed his concepts by the help of the very words found in his text But the immature pupil simply lacks the necessary background from which to form these same concepts Most textbooks fail to provide this background Most of them are too hard, too abstract, and too condensed Students must gain this background from wide reading, from field trips, from listening to their teachers, and from other sources of experience In some areas, biography, for example, serves as a better medium of learning than do textbooks [60] One could make a considerable defense of the asseveration that a textbook is something to work *toward*, not *from*

Here again we have occasion to marvel at our mistakes If there is any student who can get the content of a textbook and form adequate understandings from it alone, without the help of collateral reading, field trips, and other types of enrichment, it is the good one But in practice he is often the one who gets the enrichment, while the poor student, who has the least chance of learning anything from a condensed account, is told he had better stick by his text The implication is that he will

[60] *Cf* H Johnson, *Teaching of History in the Elementary and Secondary Schools with Applications to Allied Studies*, pp 241–280 New York The Macmillan Co, 1940

do well to get that — and indeed he will Most of our textbooks are woefully inadequate for the poorer students

Perhaps the distinction usually drawn between studying and reading is overdone If we had the right kind of books for our pupils to read, and if we took pains to see that the pupils were, by way of interest and prior training, ready to undertake a reading assignment, learning should be much less difficult than it is usually found to be It is markworthy that individuals often seem to learn more when they are not trying to learn at all, but are simply living together — thinking, talking, and working together — than they do when most concerned about learning Under ideal conditions this kind of efficiency might be extended to reading

What we are really interested in is the gaining by our students of understanding and appreciation — that is, general knowledge that is independent of the phraseology of a particular book The test of the student's having arrived at this goal is his ability to state them in his own words Perhaps we may profit from a glance at the conditions of concept formation A child does not get a mature concept of "father" just by *looking* at his patriarch, no matter how often he may repeat the observation He comes by a general concept of father by wide experience in many different situations By the same token it may be said a pupil attains safe and useful generalizations in a field of knowledge by wide experience It is only by seeing things in their various relationships that he gains a mature appreciation of them

Wide reading, in which things are seen in a variety of relationships, is more likely to lead to mature and dependable understanding than intensive reading and study of a single source, even when the total time spent is the same A mature concept of anything is attained by breadth of experience rather than by intensive experience with some one aspect of it. It is difficult to see how intensive study of a textbook can yield full-rounded, generally useful knowledge One does not gain mastery of a language by reading and rereading some one work in that language To gain a dependable knowledge of vocabulary, idiom, syntax, and so on it is necessary to read more widely

Breadth of experience also secures the right degree of generalization It guards against over-generalization and also against forming concepts that are not sufficiently general These two conditions — over-generalization and under-generalization — are serious limitations to understanding

Extensive study need not be confused with superficiality It should be the manner of investigation that is extensive Indeed, thoroughgoing extensive study leads to thorough learning

Experimental approach The problem of extensive-intensive study has proved difficult to rationalize for purposes of research This is not the kind of problem that lends itself readily to investigation by the use of a few short samples of learning material Perhaps it could be attacked profitably in a course of study in which a number of classes were taught according to the two programs Even here the outcome would depend a great deal upon the adequacy of the criterion tests They should be highly functional in character, testing not only knowledge of facts, but also understanding, ability to draw inferences, to form judgments and make applications One thing we wish to know is how the two methods of procedure compare when the amount of time devoted to study and investigation is equal Another is their comparative effect upon the student, with respect to interest, effort, and the amount of time he is willing to devote to a subject

Curtis found that in general science courses students read more, in a temporal sense, under a program of extensive reading than under a program of intensive textbook study [61] The former was said to be more effective in fostering scientific interest and attitudes Investigations by Coryell [62] in English literature and by Crawford and Walker [63] in history corrobo-

[61] F D Curtis, "Some Values Derived from Extensive Reading of General Science" *Teachers College, Columbia University, Contributions to Education*, No 163, 1924

[62] N G Coryell, "An Evaluation of Extensive and Intensive Teaching of Literature" *Teachers College, Columbia University, Contributions to Education*, No 275, 1927

[63] C C Crawford and W L Walker, "An Experiment in Teaching History Backward," *Historical Outlook*, 1931, Vol 22, pp 395–397

late Curtis' findings Rice obtained similar results in an extensive investigation of the same general plan in high school chemistry, biology, physics, and general science The groups that worked under the extensive program read 2 8 times as much as the groups that worked under the textbook program On tests given over the course material the extensive-study group generally did slightly better than the textbook group, and enormously better on a general test consisting of 500 items on general knowledge of subjects pertaining to science [64]

The writer has seen no investigations of concept formation or the gaining of general knowledge under the two procedures Psychologically this is the heart of the problem [65]

DISTRIBUTION OF PRACTICE

Ebbinghaus found, in his own case, that 38 repetitions of certain lists of nonsense syllables distributed over three days were as productive as 68 consecutive repetitions Accordingly, he suggests that "*with any considerable number of repetitions* a suitable distribution of them over a space of time is decidedly more advantageous than the massing of them at a single time" [66] Later (1897) Jost compared the effectiveness of 24 consecutive repetitions of 24 nonsense syllables with 8 repetitions a day for 3 days, 4 a day for 6 days, and 2 a day for 12 days He found that the scores benefited from distribution and that the greater the amount of distribution the greater the advantage [67]

[64] R S Rice, "Extensive Reading *Versus* Intensive Textbook Study as a Means of Acquiring Knowledge of Scientific Facts and Principles," *Journal of Experimental Education*, 1936, Vol 4, pp 376–402

[65] *Cf* C V Good, "The Effect of Extensive and Intensive Reading on the Reproduction of Ideas or Thought Units," *Journal of Educational Psychology*, 1927, Vol 18, pp 477–485 R B Weaver, "The Relative Value of Intensive Study and Extensive Reading in United States History," School Review, 1931, Vol 39, pp 217–226

[66] H Ebbinghaus, *Über das Gedachtnis*, 1885 Translated under the title *Memory* by Ruger and Bussenius, p 89 New York Teachers College, Columbia University, 1913

[67] *Cf* D O Lyon, "The Relation of Length of Material to Time Taken for Learning and the Optimum Distribution of Time," *Journal of Educational Psychology*, 1914, Vol 5, pp 85–91 and 155–163

Length of the practice period It became apparent fairly early that two variables are involved the length of the practice period and the length of time between practices In some of the experiments these two aspects have been investigated jointly, as for example, in those of Perkins and of Warden here cited for illustrative purposes

Perkins allowed her subjects 16 readings each of 16 paired lists of nonsense syllables, varying the distribution of practice as shown in Table XXXVI [68] The length of the practice period

TABLE XXXVI

RELATION BETWEEN NUMBER OF READINGS PER SITTING AND AMOUNT OF TIME BETWEEN SITTINGS AND PER CENT RETAINED

Series	Number of Readings	Distribution	Average Per Cent Retained
1	1	every day	79
2	1	every other day	72
3	1	every 3d day	82
4	1	every 4th day	68
5	2	every day	43
6	2	every other day	78
7	2	every 3d day	65
8	2	every 4th day	45
9	4	every day	25
10	4	every other day	33
11	4	every 3d day	29
12	4	every 4th day	41
13	8	every day	9
14	8	every other day	16
15	8	every 3d day	11
16	8	every 4th day	17

[68] N L Perkins, "The Value of Distributed Repetitions in Rote Learning," *British Journal of Psychology*, 1914, Vol 7, pp 253–261

is indicated by the number of readings, the length of the interval between practices is shown in the third column The comparative effectiveness of the various arrangements is gauged by retention tests exacted two weeks after the last reading

According to her data a space of one day between sittings is about as effective as longer spacings, while the advantage in favor of the smaller number of trials per sitting is quite marked and quite consistent

TABLE XXXVII

THE EFFECT OF LENGTH OF PRACTICE PERIOD AND LENGTH OF INTERVAL BETWEEN PRACTICES ON ANIMAL LEARNING

Interval between Practices	Number of Trials per Practice		
	1 Trial	3 Trials	5 Trials
6 hours	45 0	62 4	74 1
12 hours	36 8	54 8	63 6
1 day	46 4	65 4	86 1
3 days	71 9	91 1	86 1
5 days		129 7	107 1

Warden's experiment is similar to that of Perkins, except that his subjects were rats and his learning material a maze His results are given, in part, in Table XXXVII, in trials required for mastery of the maze [69]

Under the conditions of Warden's experiment a 12-hour spacing between practice periods was optimal, and the matter of interval between practices in general was found to be more important than in Perkins' investigation

An investigation by Austin, with meaningful material, is of special interest because she compared the effects of distribution on delayed as well as immediate recall [70] The effect of

[69] C J Warden, "The Distribution of Practice in Animal Learning," *Comparative Psychology Monographs*, 1923, Vol 1, Whole No 3

[70] S D M Austin, "A Study in Logical Memory," *American Journal of Psychology*, 1921, Vol 32, pp 270–403

distributed practice, as compared with massed practice, was found to increase as the interval between learning and reproduction increases This finding has been confirmed by Cain and Willey [71]

An investigation by Edwards is of special theoretical interest, because of its demonstration that distributed practice is effective for short selections of material as well as for long ones [72]

Length of interval between practices Warden, as just noted, found a 12-hour interval to be optimal among those tried In an investigation designed to duplicate, with human subjects, some of the features of Warden's experiment, Hardy obtained results that tend to agree somewhat with the findings of Perkins on this point [73]

At present we may venture to suggest that of the two issues involved in spaced practice, the length of the practice period and the length of interval between practices, the former seems to be the more important However, in the majority of experiments the shortest interval employed has usually been a day Thus in effect the foregoing says that the difference between one day and four or five days is relatively small

[71] L F Cain and R de V Willey, "The Effect of Spaced Learning on the Curve of Retention," *Journal of Experimental Psychology,* 1939, Vol 25, pp 209–214

[72] A S Edwards, "The Distribution of Time in Learning Small Amounts of Material," *Studies in Psychology Titchener Commemorative Volume,* pp 209–213 Worcester, Mass L N Wilson, 1917 *Cf* K S Lashley, "The Acquisition of Skill in Archery," *Carnegie Publications,* 1915, Vol 7, No 211, pp 107–128 L A Pechstein, "Massed *vs* Distributed Effort in Learning," *Journal of Educational Psychology,* 1921, Vol 12, pp 92–97 W H Pyle, 'Concentrated *Versus* Distributed Practice," *Journal of Educational Psychology,* 1914, Vol 5, pp 247–258 T C Ruch, "Factors Influencing the Relative Economy of Massed and Distributed Practice in Learning," *Psychological Review,* 1928, Vol 35, pp 19–45 E S Robinson, "The Relative Efficiencies of Distributed and Concentrated Study in Memorization," *Journal of Experimental Psychology,* 1921, Vol 4, pp 327–343 C I Hovland, "Experimental Studies in Rote-learning Theory III Distribution of Practice with Varying Speeds of Syllable Presentation," *Journal of Experimental Psychology,* 1938, Vol 23, pp 172–190

[73] M C Hardy, "The Effect of Distribution of Practice in Learning a Stylus Maze," *Journal of Comparative Psychology,* 1930, Vol 10, pp 85–96

Rate of item presentation Recently, distributed practice has come to mean another thing, rate of item presentation or exposure time, as in the typical memory-drum experiment [74] Varying degrees of distribution are secured by varying the exposure time per item In one condition nonsense syllables, for example, may be presented at the rate of one every two seconds, in another, every four seconds, and in another, every six seconds, and so on This form of distribution gives results similar to those obtained by the traditional forms

Distribution of practice in school The matter of the distribution of study tends somewhat to take care of itself in school by the daily character of the lesson and of the assignment The facts reviewed above, taken alone, argue in favor of short class periods, shorter than those commonly found There is, however, a considerable amount of time involved in closing one class and getting another under way Thus it may happen that an economical method from a psychological point of view may be administratively uneconomical

There appears to be a demand in education for increasing the length of the class period This has come about as a result of a change in the use made of the period — a change from a recitation to a work period, a point made earlier in connection with the cooperative assignment The tendency now is to devote considerable time to the formulation of the project to be worked on within a period Time is required to get the work under way, and considerably more time, to make the necessary investigations It is alleged that short class periods tend to encourage teacher-dominated assignments and the learning of "pat answers"

There is, however, considerable learning of discrete materials in school, spelling, handwriting, typing and shorthand, for example, in which it is quite feasible to use short practice periods In the elementary school one is likely to find that the type of activity is changed rather frequently within a class period

The one clear inference that has been drawn all along from

[74] Hovland, *op cit*

the facts of distributed practice has been the injunction against procrastination and cramming in the preparation of lessons

Theories purporting to explain the value of distributed practice

(1) *Phenomenon of set* It has been demonstrated that work under short "time sets" and small "amount sets" gives a greater yield per minute than work done under longer and larger sets An experimenter may demonstrate this, for example, by ascertaining the amount of work done per minute under instruction to work five minutes and the amount done per minute during the first five minutes under instruction to work 40 minutes It has been found that considerably more work per minute is done under the first condition than under the second [75] Indirect evidence of effort expended, such as muscular tension records, suggests that subjects work harder under that condition [76]

(2) *Efficacy of rest periods* Facts of another sort, though not entirely unrelated to set, also contribute to the explanation of the efficacy of distributed practice, namely the findings by various investigators, particularly those working in industrial psychology, that the introduction of rest periods increases output On the whole the effects have been quite marked Lorge and Gentry have amply demonstrated a similar efficacy of interpolated rest periods in learning (more or less discrete materials) For example, Lorge obtained the best results with 20 one-minute periods, and poorest with one 20-minute period [77]

These data as well as those on set have their greatest educational application in the learning of discrete materials, of which there is considerable It is probably unwise, in the absence of

[75] A G Bills and C Brown, "The Quantitative Set," *Journal of Experimental Psychology*, 1929, Vol 12, pp 301–323

[76] J B Stroud, "The Role of Muscular Tensions in Stylus Maze Learning," *Journal of Experimental Psychology*, 1931, Vol 14, pp 606–631

[77] I Lorge, "Influence of Regularly Interpolated Time Intervals upon Subsequent Learning," *Teachers College, Columbia University, Contributions to Education*, No 438, 1930 J R Gentry, "Immediate Effects of Interpolated Rest Periods on Learning Performance," *Teachers College, Columbia University, Contributions to Education*, No 799, 1940

specific experimental data, to generalize beyond the learning of such materials It is yet to be determined whether or not in a subject like geography maximum learning would be secured by frequent rest periods, as one every minute or every five minutes Disruption of continuity of thought might well cancel the advantages accruing from the rest periods This is a matter to be determined by experimentation

(3) *Differential forgetting* A final explanation of the effects of distributed practice is differential forgetting The differential forgetting hypothesis, now gaining some confirmation in experimental data, purports that erroneous associations are forgotten more rapidly than correct ones, owing perhaps to their being repeated less often These erroneous associations are presumed to interfere with the fixation of the correct ones Thus the interpolation of rest intervals provided in distributed practice allows for the weakening or elimination of erroneous associations through the process of forgetting, a process that is presumed to take place faster than in the case of the correct associations McGeoch has recently summarized the experimental evidence pertaining to differential forgetting [78]

If differential forgetting is a factor in distributed practice, or to the extent that it is, the phenomenon is limited in its application to school learning to the more or less discrete materials This is so chiefly for the reason that repetitive practice is not extensively employed in other areas If, or to the extent that, set and rest periods are factors the phenomenon may have broader application to school situations, although, as suggested earlier, the advantages may be offset somewhat by interruption in continuity of thought incident to distributed effort

EFFECT OF AMOUNT OF MATERIAL

The information relative to the relationship between amount of material and its learnableness is tremendously important so far as the understanding of the operations of mind is concerned If there were no other evidence to this effect, the fact that more trials are required to commit to memory 20 items than 10 items

[78] J A McGeoch, "*The Psychology of Human Learning An Introduction,*" pp 142–147 New York Longmans, Green and Co , 1942

should tell us that learning is a dynamic process, that there is, as it were, an interaction of part upon part A sensitive photographic plate will receive in a single exposure 1, 10, or 20 impressions of standard objects with equal fidelity Not so with the organs of mind

TABLE XXXVIII

RELATIONSHIP BETWEEN NUMBER OF STANZAS OF POETRY AND EFFORT REQUIRED TO MEMORIZE THEM

No Stanzas	Min for Reading	Total Time	Trials	Time per Stanza
2	23	75	3	38
4	30	2 10	7	52
8	91	10 00	11	1 25
12	1 44	23 00	16	1 92
18	2 09	46 00	22	2 55
25	2 90	58 00	20	2 32
35	4 08	98 00	24	2 80
50	5 84	146 00	25	2 92
75	8 77	263 00	30	3 51
100	11 66	385 00	33	3 85

Much has been made of the finding that as amount of like material is increased, difficulty increases at an increasing rate It is, of course, important to know just what the relationship is, but an equally important consideration is that it increases at all In connectionistic terminology, the efficacy of a connection depends, as one of its conditions, upon what other connections are made Perhaps no other facts of psychology argue so conclusively against the envisagement of learning, in its neurological aspects, as the forming of a simple "pathway"

In the experimental work upon this problem difficulty has been gauged both by trials and by time Both methods of reckoning difficulty are valid, although it should be clear that they are not reciprocals one of the other in this case, because as the length of list is increased learning time increases, even though the number of trials remains constant Thus, if four

stanzas were memorized in five presentations and eight stanzas, likewise in five presentations, time would have been doubled, while the number of trials remained constant Were this the case no special psychological significance would be attached to the relationship, because the increase in time would merely be a function of the mechanical requirements of presenting the material Did the number of trials remain the same, time would increase in exact proportion to increase in length If the number of trials required to memorize 20 syllables is twice as great as that required to learn a list of 10, the time is four times as great, assuming a constant rate of item presentation

Lyon investigated the relationship between length of poems, prose selections, and list of syllables, on the one hand, and difficulty, on the other, carrying all three kinds of material to great length The results for poetry are shown, in part, in Table XXXVIII Perhaps the relationship is best shown in the last column, which gives the time per stanza for the various lengths [79]

An investigation by Cofer is of special interest because it compares the effect of length upon the learning of prose substance with the effect upon memorization of prose [80] He found a more marked relationship in the case of verbatim learning [81]

[79] D O Lyon, ' The Relation of Length of Material to Time Taken for Learning and the Optimum Distribution of Time,' *Journal of Educational Psychology*, 1914, Vol 5, pp 85–91 *Cf* E S Robinson and C W Darrow, "Effect of Length of List upon Memory for Numbers," *American Journal of Psychology*, 1924, Vol 35, pp 235–243 E S Robinson and W T Heron, Results of Variations in Length of Memorized Material," *Journal of Experimental Psychology*, 1922, Vol 5, pp 428–448

[80] C N Cofer, "A Comparison of Logical and Verbatim Learning of Prose Passages of Different Lengths," *American Journal of Psychology*, 1941, Vol 54, pp 1–20

[81] *Cf* V A C Henmon, "The Relation between Learning and Retention and Amount to Be Learned," *Journal of Experimental Psychology*, 1917, Vol 2, pp 476–484 J Peterson, "Experiments in Rational Learning," *Psychological Review*, 1918, Vol 25, pp 443–467 T C Scott and L L Henninger, "The Relation between Length and Difficulty in Motor Learning, a Comparison with Verbal Learning," *Journal of Experimental Psychology*, 1933, Vol 16, pp 657–678

LEARNING AND KIND OF MATERIAL

Interrelationship between learning and memory Discussion of kind of material relates as much to the phenomena of memory as to those of learning In fact most of the conditions that affect one affect the other The relationship between learning and retention is much closer than is immediately apparent Indeed except for retention mastery of learning requiring more than a single trial would be impossible If the effects of practice were not retained from trial to trial, improvement in a function could not take place Moreover, a condition that affects the amount of learning during a given number of practices, as measured at the conclusion of practice, also affects retention as measured after a length of time

Meaningfulness of material That selections of material (of a constant number of elements) vary in difficulty is self evident Therefore, knowledge of the conditions in terms of which the difficulty of selections of constant length varies is of first-rate importance in any attempt to understand the processes of learning Such conditions as previous learning, meaning, insight, and logical character of the material suggest themselves at once In a very general sense meaning and logical character of the material, and perhaps insight, reduce to past experience Meaning, insight, and logical relations are psychological phenomena and have no existence *sui generis* in material of learning Material is not inherently meaningful, it is endowed with meaning by a reacting individual, and experience or previous reaction is necessary thereto Similarly, material is not logical apart from some one by whom it is apprehended as logical To put the matter in another way, meaningful, insightful, and logical materials are partially learned already *Transfer of training* is a necessary condition to an individual's having insight or perceiving material in a meaningful or logical way In the case of logical material the data are incorporated into the framework of a previously acquired system A list of 15 pairs of familiar words is easier to learn by far than a list of 15 pairs of nonsense syllables Inasmuch as the familiar words are necessarily already known it is

easier to provide the requisite associative cues for their recall Moreover, in learning a list of 15 words only 15 things require learning The subject already knows how to spell them In learning 15 3-letter nonsense syllables, 45 things must be learned There is no special virtue in a word save that its spelling, sound, and meanings are known already XOJ – KUC are no more difficult, meaningless, or illogical than CAT – DOG to the uninitiated

In any event, meaningful material is partially learned material Material is meaningful because past experience has made it so There is nothing of great importance to systematic psychology in the demonstration that one kind of material, meaningful, logical, related, or otherwise, is easier to learn or is better remembered than some other kind When material is made meaningful or logical it is brought within the operations of transfer of training

"This sentence is much easier to remember than a series of nonsense syllables of the same length" It is so because the letters and syllables are grouped into words which are well-known to the reader Moreover, the order of the words conforms to well established grammatical usage and, taken together, comprise what is known as a thought unit The sentence just quoted is rendered as follows in another language Il est plus facile de se souvenir de cette phrase que d'une série de syllabes de non-sens de la même longueur Needless to say, if this language is unfamiliar, the sentence will be learned with some difficulty Even so, it is not entirely strange, it is recognized as language, word units are perceived, the letters are known, and the words are pronounceable after a fashion – to such an extent does past experience transfer to this situation How would a "dawn man" have fared in committing such a sentence to memory? How would he have reproduced it, if somehow he could have gained, at a tremendous cost, a succession of appropriate visual images of it The following sentence says the same thing as the two preceding ones in still a different language

這句話比一串一樣長的無意義音節容易記

This sentence in Chinese says the same thing, approximately, as the English and French sentence referred to above It has very little meaning to most American readers, their previous learning has comparatively little pertinence to the situation, transfer is at a low point Perhaps the greatest single difficulty met — and one which, by contrast with the reproduction of English words and sentences brings into sharp relief the value of transfer in learning and remembering — is the fact that the reader does not have any previously learned *names* for the characters and does not already know how to make a graphic inscription of each such name Let us illustrate further the importance of transfer with some letters of the English alphabet E-S-U-N-E-T-O-P-Y-H-E-H-T Unless these letters are grouped in some manner most readers would experience difficulty in repeating them immediately after a single presentation, and almost no one could repeat them after an hour However, if the letters are read backward they may be reproduced immediately by every reader who can spell the words, and by nearly all such persons 24 hours later Now 13 things are reduced to 2 and those to words having a rich contextual aura A Trobriand Islander would experience equal difficulty in learning them forward or backward

Recently, Katona has published the results of some interesting research in materials that were capable of being learned only by rote and other materials that could be learned by "apprehending a principle" [82] Attention is called also to an investigation by Guilford,[83] on learning forms, and by Barker [84] in perceptual motor learning

The fact that logically organized material is learned more rapidly and retained more effectively than unorganized material is perhaps our best illustration of the efficacy of transfer. Logical systems are learned by the individual in the course of his personal history In making use of logical organization in

[82] G Katona, *Organizing and Memorizing*, Chapter II New York Columbia University Press, 1940

[83] J P Guilford, "The Role of Form in Learning," *Journal of Experimental Psychology*, 1927, Vol 10, pp 415–423

[84] R G Barker, "A Temporal Finger Maze," *American Journal of Psychology*, 1931, Vol 43, pp 634–636

learning and remembering a particular set of data a person utilizes previous experience — a condition that fulfills the requirements of the definition of transfer

Affective quality Perhaps we may with profit repeat a portion of a previous quotation from Locke " those which naturally at first make the deepest and most lasting impression are those which are accompanied with pleasure or pain" Certainly common experience supports Locke's pronouncement, as does a wealth of experimental data Much of the interest in this problem, especially that of the early workers, has centered in the *bidirectional* theory of affection This theory teaches that the two qualities of affection, pleasantness and unpleasantness, affect retention in opposite directions For pleasant material the sign is positive and for unpleasant material, negative

Thus, according to the theory, the rank order of material as to learnableness, is (1) pleasant, (2) indifferent, and (3) unpleasant

There is complete agreement as to the proposition that pleasurably experienced material has higher learning and retention value than has affectively indifferent material However, experimental research has rather definitely assigned unpleasant material to a position between the pleasant and the indifferent Experiments by Jones, Lynch, Silverman and Cason, Carter, Jones and Shock, and White, among others, have given point to this assertion [85] We may conclude that the bidirectional theory is not confirmed, but rather is experimentally eliminated (*Cf* Chapter XIV)

[85] H E Jones, "Emotional Factors in Learning," *Journal of General Psychology*, 1929, Vol 2, pp 263–272 C A Lynch, "The Memory Values of Certain Alleged Emotionally Toned Words," *Journal of Experimental Psychology*, 1932, Vol 15, pp 298–315 A Silverman and H Cason, "Incidental Memory for Pleasant, Unpleasant, and Indifferent Words," *American Journal of Psychology*, 1934, Vol 46, pp 315–320 H D Carter, H E Jones, and N W Shock, "An Experimental Study of Affective Factors in Learning," *Journal of Educational Psychology*, 1934, Vol 25, pp 203–215 M M White, "Some Factors Influencing Recall of Pleasant and Unpleasant Words," *American Journal of Psychology*, 1936, Vol 48, pp 134–139

CHAPTER XIV

CONDITIONS OF RETENTION AND FORGETTING

The processes of retention and forgetting cannot be studied directly, we investigate them indirectly by determining the effect of varying conditions upon recall and recognition, together with other measures described presently We use the terms *retention* and *remembering* in a variety of senses We remember a verse if we can recite it, a historical fact if we can describe it, a mathematical principle if we can apply it, a former acquaintance if we can call his name or recognize his face These various uses occasion no particular difficulty in popular speech except when we assume the results obtained by one criterion to equal those obtained by another, as in the customary comparisons of names and faces We do not apply the same test of memory to the two cases For remembering faces we commonly apply the test of recognition, for names, recall, a much more exacting test As a matter of fact there is not a great difference between the recognition of names and the recognition of faces, or between the recall of names and the recall of faces

We sometimes speak of retaining learned material, as if the material were stored in our heads Actually we do not, of course, do anything to material when we learn it in the first place We learn to make responses with respect to it, and what is retained or forgotten is this ability to respond To put the matter in a different light, learning is, putatively, accomplished by the modification of neuro-muscular tissues Retention means the persistence of modification, forgetting, the loss of it

MEASURES OF RETENTION AND FORGETTING

Two indices, *recall* and *recognition,* have already been mentioned Both are used in psychological laboratories in a va-

riety of ways Recall may be written or oral, verbatim or in substance, aided or unaided Recognition, in laboratory practice, involves in its commonest form the identification of words, objects, or other items, previously presented Typically, the items that have been submitted to learning are presented to the subject in mixture with a large number of other items of the same general class The test consists in the subject's ability to identify those previously responded to in the learning situation

Educational psychologists have made considerable use of the *objective test* as a means of measuring retention In the main these are of two kinds the completion test, involving directed recall, and the true-false and multiple-choice tests, commonly spoken of as recognition tests, although the recognition feature of the latter kind of test should not be insisted upon strictly The subject may make use of recall in varying degrees Another measure of retention — one that has not been used specifically as a measure of retention, but which has considerable applicability especially in academic learning — is *transfer of training*

A widely used and a highly satisfactory measure of retention is the *saving score* This score equals the ratio of the difference between trials to learn to a criterion and trials to relearn to trials to learn The method is known as relearning, the measure, as a saving score

$$\text{Saving score} = 100 - \left(\frac{\text{trials to relearn}}{\text{trials to learn}} \times 100\right)$$

If a subject requires 16 trials to learn a list to a criterion and 6 trials to relearn it two weeks later, his saving score is 62 5, he has saved 62 5 per cent The method of relearning is not very practical except in experiments in memorization and in the acquisition of acts of skill It is scarcely available in the measurement of retention of most school subjects A final method of measuring retention is *reconstruction* The subject is required to arrange the items in a list in the order of their appearance in the learning trials

Any and all of the foregoing methods are valid measures

They do not, of course, give the same result This is not a limitation if the methods are not used interchangeably

THE RATE OF FORGETTING

Curves of forgetting Of the many results of Ebbinghaus' classical experiments in memory, the most celebrated is his curve of retention [1] The data on which this curve is based are given in Table XXXIX, the curve itself, with Luh's curve superimposed, is reproduced in Figure 10 [2]

TABLE XXXIX

TEMPORAL RATE OF FORGETTING

Interval	No Tests	Per Cent Retained
19 min	12	58 2
63 min	16	44 2
8 hrs , 45 min	12	35 8
1 day	26	33 7
2 days	26	27 8
6 days	26	25 4
31 days	45	21 1

Most investigators have found higher retention than did Ebbinghaus This in itself is a matter of no particular psychological importance Ebbinghaus' comparatively low retention scores may have been the result of individual idiosyncrasies (he was his own and only subject) or to other factors peculiar to his investigation He learned several lists, one after another, at a single sitting and continued to learn other lists during the various time intervals over which retention was being tested In terms of data presented later these are the conditions that would yield the greatest amount of forgetting Also, his retention tests were usually made at the end of the

[1] H Ebbinghaus, *Memory*, pp 68–75 (translation by H A Ruger and C E Bussenius) New York Teachers College, Columbia University, 1913 (First published in German in 1885)

[2] C W Luh, "The Conditions of Retention," *Psychological Monographs*, 1922, Vol 31, Whole No 142

day or at the conclusion of a lengthy learning exercise Thus, there is the possibility that fatigue factors were present

We may now inquire as to the meaning and generality of the Ebbinghaus curve Let it be said at once that it does not mean that 66 3 per cent of what one learns is forgotten within 24 hours This does happen to be the figure obtained by Ebbinghaus, but it should be emphasized that 66 3 is the per cent forgotten by Ebbinghaus himself of the material used by him (nonsense syllables), learned to his criterion (two errorless repetitions) under the conditions of his experiment, and as measured by a particular method (relearning) It is known that the amount of forgetting per constant unit of time is

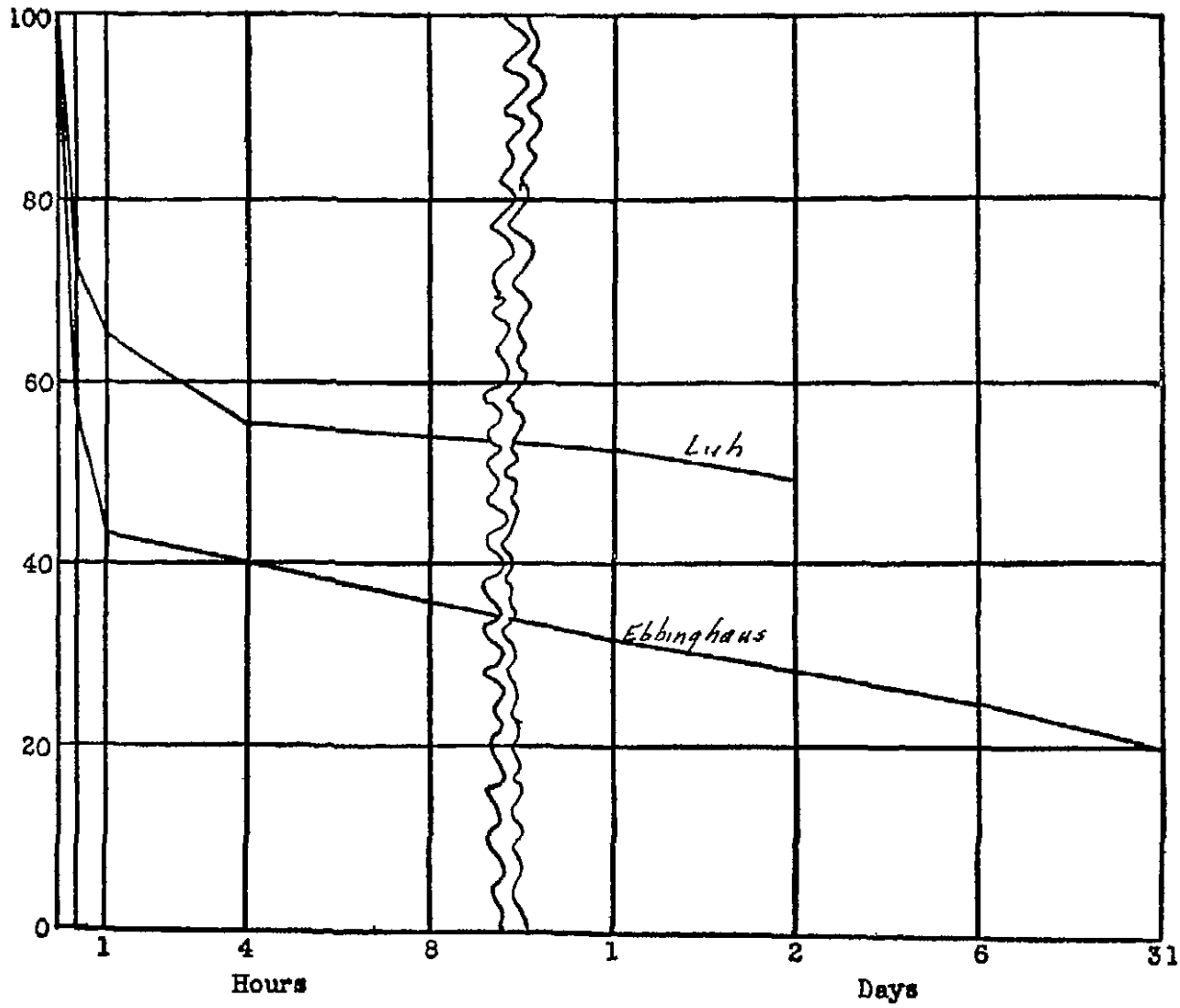


FIG 10 THE EBBINGHAUS CURVE OF FORGETTING
(Luh's data are shown in the upper line)

highly variable, depending especially on the following conditions the peculiarities of the subject, the nature of the material, the degree of learning, the method of learning, the activities of the subject between learning and the making of the retention test, and the nature of the test made, that is, the method of measurement used In the light of these facts it is obvious that no general statement can be made about the *amount* of learned material that will be retained, apart from the foregoing variable conditions

On the whole, an individual does forget the greater part of what he learns It does not follow, however, that one forgets within one day the greater part of what he learns, nor does the significance of the Ebbinghaus curve lie in showing how much of anything a subject forgets

The importance of Ebbinghaus' discovery lies in his demonstration that the initial rate of forgetting is more rapid than the rate at the later stages, that the subject forgets more during the first fourth or tenth of an interval of no practice than during any successive fourth or tenth, and that the rate decreases during successively equal intervals These features of the curve are much more general than has usually been claimed It would be surprising if there were no exceptions, but it appears that many of the alleged exceptions are artificial rather than real One difficulty comes from a tendency to confuse the issue between *amount* forgotten and the *form* of curve

The Wherry formula The Ebbinghaus curve, as may be seen from inspection, approximates rather closely the logarithmic curve Ebbinghaus, in fact, held that the ratio of what is retained to what is forgotten varies inversely with the logarithm of time Wherry has suggested that this statement may be transformed into the following formula [8]

$$\frac{R}{F} = \frac{k}{\log \frac{10T}{T_1}}$$

[8] R J Wherry, "The Curve of Forgetting Its Statistical Application," *Journal of Educational Psychology*, 1932, Vol 23, pp 621–624

Where R = amount retained in per cent
F = amount forgotten in per cent ($F = 100 - R$)
k = a constant to be determined for a given set of data
T_1 = time between learning and first testing
T = time between learning and any other testing

This formula has been applied to the data reported in Table XXXIX The predicted R's together with the empirical R's are as follows

Time Interval	63 min	8¾ hrs	1 day	6 days	31 days
Empirical R	44 2	35 8	33 7	25 4	21 1
Predicted R	47 7	36 3	32 7	27 7	24 2

If the predictions of the Wherry formula or of any similar formula are to be used as proof of the generality of the Ebbinghaus curve, such a formula must succeed for various kinds of learning material and for various methods of measuring retention The writer has applied the Wherry formula to several sets of data obtained by various methods of measuring retention When retention is measured by relearning and by objective tests, the formula predicts rather well When retention is measured by the methods of recognition and recall, systematic over-prediction results, as is illustrated in Table XL [4]

RETENTION OF WHAT IS LEARNED IN SCHOOL

A wholly satisfactory answer to the question of retention of academic learning is not at present available, nor are we able to say with certainty how much this matters A man of 40 or 50 can recall comparatively little of what he learned in high school or college Realization of this state of affairs has led some to doubt the wisdom of their having gone to college or high school The fallibility of this position, if assumed generally, is too obvious to require comment A more important test of the value of what is learned in school is how much it transfers to life situations, how much it becomes the basis for the acquisition of other knowledge, how much it is utilized as a basis of a lifetime of growth and professional development

[4] Data taken from articles cited elsewhere in this chapter

TABLE XL

COMPARISON BETWEEN EMPIRICAL DATA AND PREDICTIONS OF WHERRY FORMULA

Experimenter	Method of Measuring Retention	Length of Interval	Obtained Score in Per Cent	Predicted Score in Per Cent
Luh (material, nonsense syllables)	Relearning	20 min	75 0	
		60 min	65 9	67
		4 hrs	54 9	59
		1 day	52 1	51
		2 days	47 7	49
	Recognition	20 min	97 8	
		60 min	94 6	97
		4 hrs	93 3	96
		1 day	74 6	94
		2 days	71 5	93
	Anticipation (Recall)	20 min	67 8	
		60 min	50 2	59
		4 hrs	39 0	50
		1 day	17 8	42
		2 days	10 0	40
Spitzer (material, specially prepared prose passages)	Objective Test	1 day	73	
		7 days	59	59
		14 days	53	56
		21 days	49	54
		28 days	51	52
		63 days	48	49

The most important question that can be asked about the value of schooling is, How much does it have to do with the individual's later growth and development?

Bunch's investigations on the permanence of transfer effects are significant, first, in calling attention to a very useful meas-

ure of retention that had not generally been recognized as such a measure, and, second, in discovering that these effects give evidence of much greater permanence than other products of learning Doubtless the latter will be construed as a happy circumstance by the educator [5]

Retention of school learning in an exact and identifiable form decreases in importance as the individual grows older This brings us to one of the limitations of the investigations of retention of academic learning, at least a limitation in the significance of the results The procedure usually followed is that of administering a battery of tests covering a given subject matter field, as American history, at the beginning of a course and again at the end of the course, the difference between the initial and final scores being taken as a measure of learning The pupils are then divided into three or four equated groups, each of which will be re-examined by the same battery of tests after varying intervals, say from 4 to 24 months The difference between the learning and retention scores represents the amount forgotten Strictly, the score obtained at the end of the semester is also a retention score So, actually, a comparison is made between the amount of material retained at the end of a semester with that retained 4, 8, 16, and 24 months afterwards, or after other intervals as required

Also, a battery of tests that affords satisfactory evidence of achievement in a course is not necessarily a satisfactory measure of retention when administered 12 or 24 months later, especially if it requires information that is detailed and highly specific to the content of the course An examination that is functional in character would in many respects give a more valid picture of the retention of academic learning Skill in

[5] M E Bunch, "The Amount of Transfer in Rational Learning as a Function of Time," *Journal of Comparative Psychology*, 1936, Vol 22, pp 325–337 M E Bunch, "Transfer of Training in the Mastery of an Antagonistic Habit after Varying Intervals of Time," *Journal of Comparative Psychology*, 1939, Vol 28, pp 189–200 M E Bunch, "A Comparison of Retention and Transfer of Training from Similar Material after Relatively Long Intervals of Time," *Journal of Comparative Psychology*, 1941, Vol 32, pp 217–231

treating data, knowledge of where and how to find information, ability to do independent thinking and apply the results of learning, and even respect for factual information are criteria in the light of which retention of course material should be weighed

Retention in college courses An investigation at the college level, conducted by Johnson, is here described for illustrative purposes[6] The course of study was botany and the subjects, university students One group of students was given a retention test after 3 months, another group, after 15 months, and the third group, after 27 months This procedure enjoins upon the experimenter the necessity of establishing the comparability of his groups – comparability with respect to such variables as achievement in the course in question, general scholastic achievement, and test intelligence Johnson supplies the following information about his groups

Group	N	Months After Completion of Course	Mean Botany Grade	Mean *HPR*	Mean *PR*
2	24	0	2 65	1 26	58
3	24	3	2 65	1 26	58
4	29	15	2 80	1 32	50
5	22	27	2 83	1 42	57

In the foregoing, *HPR* means honor point ratio, and *PR*, percentile rank in intelligence test performance Figure 11 gives a graphic representation of retention in median and Q_1 and Q_3 values, after 3, 15, and 27 months

Other investigations at the college level, which have yielded quite comparable results, are those by Cederstrom[7] and

[6] P O Johnson, *Curricular Problems in Science at the College Level,* pp 64–104 Minneapolis University of Minnesota Press, 1930 Also, P O Johnson, ' The Permanence of Learning in Elementary Botany," *Journal of Educational Psychology,* 1930, Vol 21, pp 37–47

[7] J A Cederstrom, " Retention of Information Gained in Courses in College Zoology," *Journal of Genetic Psychology,* 1930, Vol 38, pp 516–520

Greene,[8] in zoology, Eurich,[9] Jones,[10] and Watson[11] in psychology, and Greene in physics and chemistry

Retention in high school courses Frutchey has published the results of an investigation of retention of high school chemistry, in which tests designed to measure attainment in various objectives were administered at the beginning of the course, at the end of the course, and again a year later The results in terms of the percentage of the gain that was retained are shown in Table XLI[12]

TABLE XLI

RETENTION, AFTER ONE YEAR, OF GAIN MADE IN A COURSE IN HIGH SCHOOL CHEMISTRY

Objectives Tested	Percentage of Gain Retained
Knowledge of facts	84
Application of principles	92
Terminology	66
Symbols, formulas, valence	70
Balancing equations	72

Frutchey's investigation is similar to one reported by Tyler[13] His results are also similar in respect to the general finding that memory for terminology showed the greatest loss Tyler's students, college, lost within a 15-month period of no formal work

[8] E B Greene, "The Retention of Information Learned in College Courses," *Journal of Educational Research*, 1931, Vol 24, pp 262–273

[9] A C Eurich, "Retention of Knowledge Acquired in a Course in General Psychology," *Journal of Applied Psychology*, 1934, Vol 18, pp 209–219

[10] H E Jones, "Experimental Studies of College Teaching," *Archives of Psychology*, 1923, Vol 10, Whole No 68

[11] R I Watson, "An Experimental Study of the Permanence of Course Material in Introductory Psychology," *Archives of Psychology*, 1938, Vol 32, Whole No 225

[12] F P Frutchey, "Retention in High-school Chemistry," *Journal of Higher Education*, 1937, Vol 8, pp 217–218

[13] R W Tyler, "Permanence of Learning," *Journal of Higher Education*, 1933, Vol 4, pp 203–204

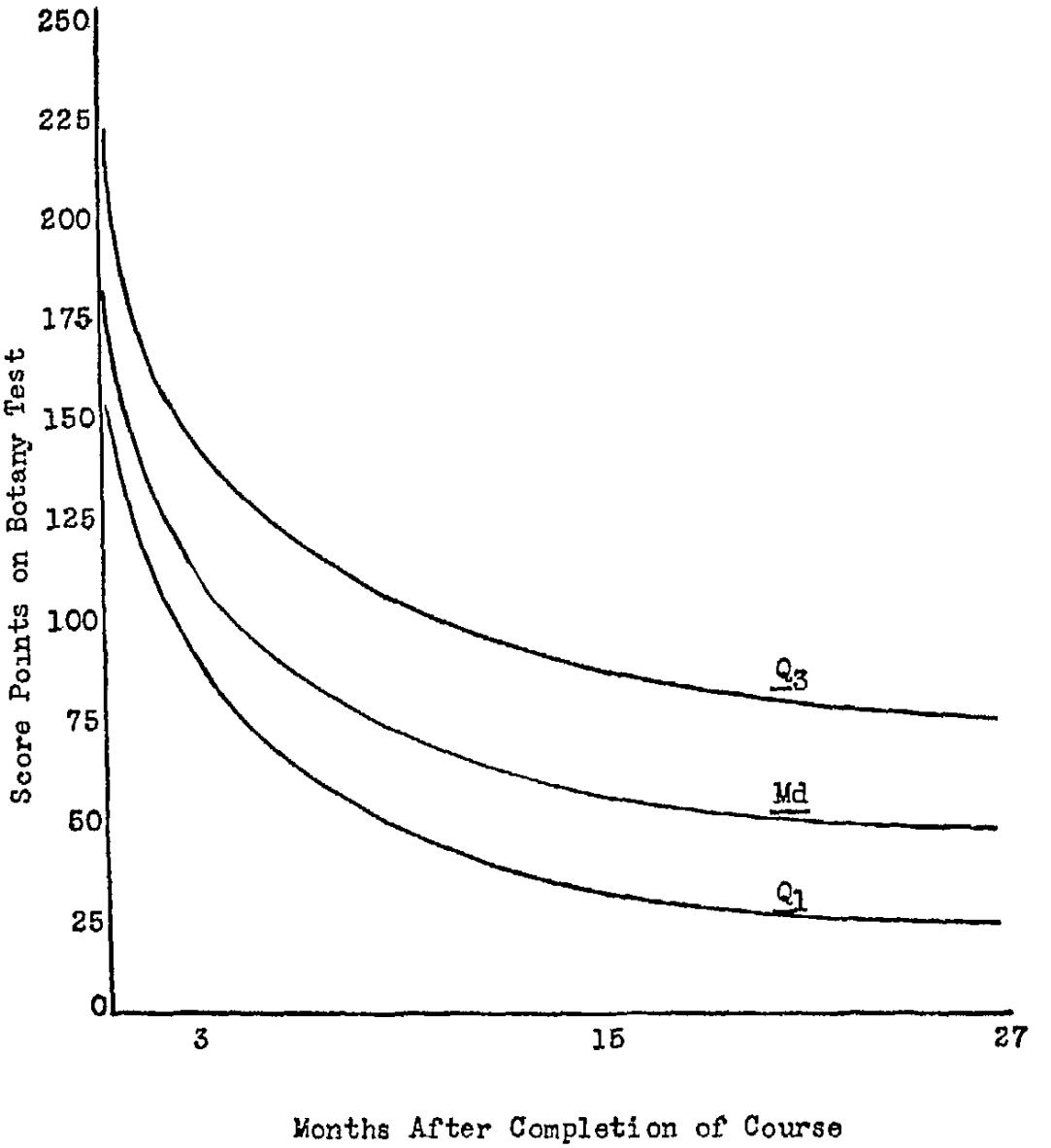


FIG 11 RETENTION OF BOTANY AS MEASURED BY REPETITION OF EXAMINATIONS 3, 15, AND 27 MONTHS AFTER COMPLETION OF COURSE

in zoology 77 per cent of the gain achieved in "naming animal structures pictured in diagrams" In "interpreting new experiments" the loss was 25 per cent, and in "applying principles to new situations," 7 per cent It is indicated that the retention of ability to use scientific apparatus and to evaluate critically scientific experiments, both of which are objectives of courses in science, is relatively high

Layton administered a New York State Regents' Examination in elementary algebra to ninth grade pupils in a certain

high school one month before the close of the school year [14] Following a month of "intensive review," the test was readministered, and 11 months afterward, was given a third time During this 11-month interval no mathematics of any kind was formally studied, and it is safe to judge that little was used during the period A mean score of 71 3 was obtained on the first administration, of 87 1, on the second — after a month of reviewing, and of 56 2, on the third administration

In the main the results of retention of learning in school are quite encouraging This is especially true of the more highly functional and, therefore, the more highly useful kinds of learning [15]

Retention of American history, Grades 7 and 8 Brooks and Bassett, in an investigation of retention of American history by seventh and eighth grade pupils, administered objective tests at the end of the semester and again 4, 8, 12, and 16 months later The tests were readministered to the same pupils every 4 months, with the exceptions indicated in Table XLII The authors state that each half grade in American history, for Grades 7B, 7A, 8B, and 8A, was a "distinct unit with no overlapping" in subject matter This is meant to indicate that although the pupils continued to study American history, there was no *formal* review of the units the retention of which was under investigation Table XLII gives the pertinent data of their investigation [16]

[14] E T Layton, "The Persistence of Learning in Elementary Algebra," *Journal of Educational Psychology,* 1932, Vol 23, pp 46–55

[15] *Cf* J A Drushel, "A Study of the Amount of Arithmetic at the Command of High School Graduates Who Have Had No Arithmetic in Their High School Course," *Elementary School Journal,* 1917, Vol 17, pp 657–661 L R Kennedy, "The Retention of Certain Latin Syntactical Principles by First and Second Year Latin Students after Various Time Intervals," *Journal of Educational Psychology,* 1932, Vol 23, pp 132–146 E L Thorndike, "The Permanence of School Learning," *School and Society,* 1922, Vol 15, pp 625–627 S R Powers, "How Long Do Students Retain What They Have Learned from High School Chemistry?" *Journal of Chemical Education,* 1925, Vol 2, pp 174–180 D A Worcester, "The Permanence of Learning in High School Subjects — Algebra," *Journal of Educational Psychology,* 1928, Vol 19, pp 343–345

[16] F D Brooks and S J Bassett, "The Retention of American History in the Junior High School," *Journal of Educational Research,* 1928, Vol 18, pp 195–202

TABLE XLII

SCORES IN AMERICAN HISTORY IN GRADES 7B, 7A, 8B, AND 8A AT CLOSE OF SEMESTER AND AT FOUR INTERVALS THEREAFTER

		Mean Score				
Grade	N	At close of semester	4 mo	8 mo	12 mo	16 mo
7B	167	50 2	43 7			
	107	55 1	47 3	43 8		
	64	56 6	47 6	44 7	40 7	39 0
7A	143	59 9	53 8	50 2		
	120	61 1	54 4	50 6	48 6	
	86	60 1		51 5		
8B	79	61 9	50 5			
	44	58 4	47 3	44 1		
8A	21	54 7	49 5	46 3		

Retention of general science An investigation by Word and Davis is of special interest because it measured at the end of an 18-week period the retention of knowledge acquired at various stages within the period.[17] Whereas the aforementioned investigators have made tests of the retention of knowledge gained in a course at varying periods after the completion of a course in this study tests are made at the close of the semester of the retention of knowledge acquired during the various two-week periods within the semester

It was found that under the conditions of the investigation there was no net loss – if anything a slight gain Two features of the course of study as conducted deserve mention First it was highly integrated, and second, there was systematic review and examination every two weeks One-half of the test items administered at the end of each two-week period dealt with the material covered within that period, and one-half, with the material covered in the previous two-week period

[17] A H Word and R A Davis, "Acquisition and Retention of Factual Information in Seventh-grade General Science during a Semester of Eighteen Weeks," *Journal of Educational Psychology,* 1939, Vol 30, pp 116–125

Forgetting during the summer vacation Almost every school system that has made use of a systematic testing program has collected some information on this topic, since the bare requirements of such an investigation are met by administering tests at the close of one school year and at the beginning of the next The so-called tool subjects have seen more work of this character, by far, than have any of the others

We should anticipate that the amount of forgetting during a summer vacation will be found to be relatively small in comparison with that obtained in a like period of time in laboratory experiments Owing to the employment of drill and review and their daily use, a great deal of over-learning is normally achieved in the tool subjects Moreover, pupils continue in varying degrees to exercise the skills involved during the summer *A priori*, one would expect a comparatively small loss in reading (Many students actually show a gain) Spelling and arithmetic, and possibly handwriting, would be expected to show somewhat greater deterioration

In the following paragraphs the principal trends for certain subject matter fields are indicated

(1) *Reading* In the Minneapolis Public Schools Brueckner and Distad found no important differences in reading for Grades 1A and 1B, measuring proficiency at the end of one school year and the beginning of the next In Grade 1C a loss was obtained, especially among the students of lowest test intelligence [18]

Irmina obtained a slight loss in word recognition and in the reading of directions by the first grade, and a significant loss in word, phrase, and sentence reading All of the losses had been recovered by October [19] In Grade 2 she found a slight gain in word recognition and in the reading of directions, but no change in word, phrase, and sentence reading She obtained evidence of a loss in ability to get the central meaning

[18] L J Brueckner and H W Distad, "The Effect of Summer Vacation on the Reading Ability of First-grade Children," *Elementary School Journal*, 1923–24, Vol 24, pp 698–707

[19] Sister M Irmina, "The Effects of the Summer Vacation upon the Retention of the Elementary School Subjects," *The Catholic University of America Research Bulletin*, 1928, Nos 3 and 4

of paragraphs on the part of pupils in Grade 3, as well as in ability to understand precise directions Morrison found evidence of a gain in reading achievement for the first three grades [20] Evidence of a loss in reading achievement in the primary grades during the summer vacation is slight indeed [21]

(2) *Spelling* The evidence points uniformly to a loss in proficiency in spelling achievement during the summer vacation The magnitude of such loss is not great and the loss is recovered within from 2 to 4 weeks after the resumption of school in September [22]

(3) *Arithmetic* In general there is a loss of proficiency in arithmetic during the summer vacation, although the loss is not uniform in magnitude for all processes Arithmetic reasoning suffers very little, while the greatest decrement is found in computation That there should be considerable loss in computation is to be expected in view of the large amount of time required in the school program to maintain the computational skills at the level set by the makers of drill exercises and tests Whether or not the pupil has any real need for "lightning speed" in arithmetic is another question

It has been found, as is to be expected, that maintenance programs carried on during the summer vacation prevent the occurrence of the normal losses in arithmetic and may even result in a gain Likewise, special review exercises at the close

[20] J C Morrison, "What Effect Has the Summer Vacation on Children's Learning and Ability to Learn?" *Educational Research Bulletin,* 1924, Vol 3, pp 245–249

[21] *Cf* E Bruene, "Effect of Summer Vacation on the Achievement of Pupils in the Fourth, Fifth, and Sixth Grades," *Journal of Educational Research,* 1928, Vol 18, pp 309–314 M E Noonan, "Influence of the Summer Vacation on the Abilities of Fifth and Sixth Grade Children," *Teachers College, Columbia University, Contributions to Education,* No 204, 1926 M V W Patterson and N Y Rensselaer "The Effect of Summer Vacation on Children's Mental Ability and on Their Retention of Arithmetic and Reading," *Education,* 1925, Vol 46, pp 222–228 M Schrepel and H R Laslett, "On the Loss of Knowledge by Junior High School Pupils over the Summer Vacation," *Journal of Educational Psychology,* 1936, Vol 27, 299–303

[22] Bruere, *op cit* Irmina, *op cit* M J Nelson, "How Much Time Is Required in the Fall for Pupils of the Elementary School to Reach Again the Spring Level of Achievement?" *Journal of Educational Research,* 1928, Vol 18, pp 305–308

of the school year are instrumental in reducing the losses incident to the summer vacation [23]

(4) *Content subjects* The literature pertaining to the effect of the summer vacation on test performance in the content subjects presents an inconclusive picture Morrison and Irmina report gains in test achievement in history and literature Bruene finds a small gain in nature study and science, but a loss in history and literature On the other hand, Irmina obtained a slight loss in nature study and science The data at hand give no evidence of a trend

THE PHENOMENON OF REMINISCENCE

In 1913 Ballard discovered a phenomenon, named by him *reminiscence,* which is contrary to the prediction of the Ebbinghaus curve Williams corroborated Ballard in a systematic investigation published in 1926 Contrary to the Ebbinghaus curve, which shows a precipitous drop in retention immediately after the completion of practice, Ballard,[24] and later Williams,[25] found an increment for the two ensuing days, after which the curves began to assume the shape of the Ebbinghaus curve The peak was reached on the second day and not until the third did the curves drop to a level commensurate with the attainment at the conclusion of practice In these experiments subjects were given a predetermined number of practices, but a number insufficient to allow complete mastery

Ward,[26] and subsequently, Hovland [27] have demonstrated

[23] L D Morgan, "How Effective Is Special Training in Preventing Loss Due to the Summer Vacation," *Journal of Educational Psychology,* 1929, Vol 20, pp 466–471 Bruene, *op cit* Irmina, *op cit* Nelson, *op cit* Noonan, *op cit* Patterson, *op cit*

[24] P B Ballard, "Obliviscence and Reminiscence," *British Journal of Psychology, Monograph Supplement,* 1913, Vol 1, No 2

[25] A Williams, "A Study of the Phenomenon of Reminiscence," *Journal of Experimental Psychology,* 1926, Vol 9, pp 368–387

[26] L B Ward, "Reminiscence and Rote Learning," *Psychological Monographs,* 1937, Vol 49, Whole No 220

[27] C I Hovland, "Experimental Studies in Rote-learning Theory I Reminiscence Following Learning by Massed and by Distributed Practice," *Journal of Experimental Psychology,* 1938, Vol 22, pp 201–224 C I Hovland, "Experimental Studies in Rote-learning Theory II Reminiscence with Varying Speeds of Syllable Presentation," *Journal of Experimental Psychology,* 1938, Vol 22, pp 338–353

the operation of reminiscence of a different character They found in syllable learning a reminiscence effect which persisted for 30 seconds after practice, the high point being maintained for about two minutes This effect, while necessitating a qualification of the Ebbinghaus curve, is readily capable of being harmonized therewith In the Ebbinghaus paradigm, in which the first retention test is made after a lapse of several minutes, the Ward-Hovland effect is masked The latter probably has nothing to do with Ballard-Williams reminiscence

FACTORS IN RETENTION

Forgetting is one of the normal attributes – perhaps one of the inevitable consequences – of mental life No person or no kind of material is immune However, the amount of forgetting is by no means a constant It is the purpose of the following paragraphs to present some of the factors in terms of which retention and forgetting vary

Review We may take it for granted that review has educational value If reviews are intensive enough and frequent enough, material may be retained at its original level Some educators have eschewed review because of certain undesirable connotations, particularly because of its mechanical aura In one of its meanings review does undeniably suggest repetitive, verbalistic practice Perhaps we may all agree that, except possibly in spelling and in the computation skills and in the case of certain items of detailed knowledge, this form of review should be generally avoided At least, there are ways of implementing review that are much more in line with progressive principles of education

(1) *Objectives of review* We should not be deceived by the apparent simplicity of the term *review* In reviewing a spelling lesson or simple addition and subtraction facts, review may be a *re-view*, a looking back But there is another meaning of review, namely *critical examination*, as when one reviews a book or the literature pertaining to a particular topic This usage is hardly consonant with the meaning of review in school However, by a slightly different phrasing – *critical re-examination* – this concept may be made applicable to teaching situa-

tions Intelligent review of content material may be, and should be, made the medium of *gaining new insight* as well as looking back at concepts and understandings already gained and fixing them more firmly in mind Review of a unit of instruction may be made to serve the purpose of *integrating* the content of that unit with a view to attaining *useful generalizations* It may also serve to relate a unit of instruction with a previously studied unit, with the result that the understanding of both units is enhanced

Review provides an opportunity for thinking critically about the material of instruction It should also be realized that use in a new situation of material previously learned is a review also Review does not have to be formal, repetitive practice, as in catechetical learning Moreover, material of instruction may be so well integrated as to make formal review unnecessary

(2) *Methods of implementing review* Our present interest lies chiefly in two problems, methods of reviewing and temporal distributions of review exercises In general, methods may be classified under two heads, *symbolical* review, as in recall, and review by *reimpression*, as in rereading and relistening It is important to observe this distinction because the optimal temporal point of reviewing is related to method

Review by reimpression is a pretty obvious method and needs only to be mentioned A pupil utilizes this method when he reads again at a later date a lesson previously prepared On the other hand, there are various ways of implementing symbolical review Direct recall, already mentioned, is one As we shall have occasion to see presently, one can by frequent indulgence in this form of symbolical practice virtually prevent forgetting Although direct formal recall has a place in education, particularly in the mastery of specific items of factual information, as in learning the names of bones and muscles, it is of interest chiefly as a psychological phenomenon rather than as a teaching method As a general thing, in connection with learning in school, we wish to have our pupils think about material they have studied It is understood, of course, that in order to accomplish this, pupils will practice recall, but it

should be recall for thinking, for understanding, for organizing and systematizing, not just recall

Recall for thinking provides for maintenance by use and application It accomplishes all that formal review does and at the same time serves other important educational purposes It helps to organize and integrate knowledge and thus foster generalization We should render our pupils a great service if we could lead them to form the habit of consciously applying to each learning situation data learned in other situations Correlation, integration, and systematization are accomplished, if at all, in the minds of the pupils It does not necessarily follow that because the history teacher and the literature teacher happen to be teaching at the same time a common period of history the learners will make much use of one in studying the other Here again we may note that "reaction to," "confirming responses," "re-enforcement" are requisite conditions of learning The student of literature should avail himself of every opportunity of applying the facts learned in his history As much may be said of reviewing mathematics in the study of physics This is necessarily accomplished to some extent, but if it is consciously done, even to the extent of formally stating the mathematical applications, learning, which might be much better done by systematic planning, is not left to chance A student of education can use his methods courses as a means of consciously reviewing his psychology, with the result that his understanding of both will benefit

Moreover, within the framework of a single course of study review may be mediated by the application of information acquired in one part of the course in attacking another part This application should not be left to chance or the whim of the pupil, but should be provided for as a step in the process of teaching This step is illustrated, for example, in some of the modern textbooks in high school mathematics wherein the pupil is frequently called upon to state the previously learned principles involved in a given operation

The good student is likely to be a pretty shrewd individual He makes intelligent use of his opportunities to learn Let us

turn to one of the methods of teaching the English language, namely the reading of masterpieces It is a notorious fact that a pupil may read an enormous amount of such material with comparatively little profit – without the requisite psychological conditions of learning being met When the proper conditions are met, such reading may form the basis of genuine learning One essential condition is that good usage be recognized and reacted to as such If a pupil happens to be concerned with punctuation, he should be observant of punctuation, and should justify in his own mind the punctuation used – and might go so far occasionally as to recall a rule governing a case Likewise he should react to the various elements that go into good literature, diction as diction, syntax as syntax, style as style, and so on, applying wherever possible his knowledge of composition As the reader thus applies his previous learning to a *present situation*, the reading of masterpieces may be made the basis of learning the English language In a learning situation one learns what he practices, *i e*, what he reacts to One of the things meant by literary appreciation is an understanding of what has gone into a production

Other available and defensible means of inducing review are the *summary*, the *class discussion*, and the *act of taking tests* They are available because they are procedures over which the teacher has a certain amount of control They are defensible because they avoid, or can readily be made to avoid, the mechanical features of review, so common in the memoriter method of past generations The summary may be made to co-ordinate recall, re-examination, and organization The test and the class discussion may be used to induce critical thinking as well as recall

(3) *When to review* A recommendation of long standing in educational psychology is that the initial review should come soon after learning, on the same day according to one author, and that of several reviews, the initial ones should be frequent, that is, closely spaced, with a longer interval of time elapsing between each successive review This suggests that of several review exercises the time of their occurrence should be in arithmetical ratio Lyon, Thorndike, Starch, Gates, Jordan, and

others have taken this position This recommendation is deduced from the Ebbinghaus curve of retention

> The practical bearing of the results obtained on education in general is that when associations have once been formed they should be recalled before an interval so long has elapsed that the original associations have lost their "color" and cannot be recalled in the same "shape," time, and order In general it was found that the most economical method for keeping material once memorized from disappearing, was to review the material whenever it started to "fade" Here also the intervals were found to be, roughly speaking, in arithmetical proportion For similar reasons the student is advised to review his "lecture notes" shortly after taking them, and if possible, to review them again the evening of the same day Then the lapse of a week or two does not make so much difference When once he has forgotten so much that the various associations originally made have vanished, a considerable portion of the material is irretrievably lost [28]

Subsequent experimentation has justified Lyon's recommendation for one kind of review, recall, or symbolical review In this category falls also review by the aid of lecture or reading notes Such notes are not, as a rule, very complete, and have as their principal function the stimulating of recall On *a priori* ground one may infer that the review value of recall will stand as some function of the amount of previously learned material that is recallable and that when all is lost beyond recall, review attempts will avail but little Experimentation has confirmed this inference

Recent investigations by Spitzer, Sones and Stroud, Spencer, and Stroud and Freeburne corroborate Lyon Spitzer determined the effect on retention scores of taking a multiple-choice test at varying intervals after the presentation of the learning material His sixth grade subjects were divided into several comparable groups ranging from 266 to 369 per group Achievement was measured by means of a 25-item, multiple-choice test The results are shown in part in Table XLIII and in Figure 12 In both, B refers to Test B, the criterion test, the score following B_1 is the score achieved the first time Test

[28] D O Lyon, "The Relation of Length of Material to Time Taken for Learning, and the Optimum Distribution of Time," *Journal of Educational Psychology*, 1914, Vol 5, pp 155–163

B was taken, B_2 and B_3, the scores achieved the second and third time the test was taken The numbers along the top of the table signify the time at which the test was administered [29]

It is seen that the mean score of Group VIII on the 63d day after the original presentation of the material is 6 4 This group had not previously taken the test Since the groups were shown to be comparable, we may regard the variations in the testing

TABLE XLIII

MEAN SCORES ON TEST B AS ADMINISTERED AT VARIOUS PERIODS AFTER LEARNING

Group	Mean Score On Pre-test	Time in Days at Which Test Was Given						
		0	1	7	14	21	28	63
I	15 03	B_1 13 2	B_2 13 1			B_3 12 2		
II	15 05	B_1 13 2		B_2 11 84				B_3 10 7
III	15 00		B_1 9 6		B_2 8 9			
IV	15 00			B_1 7 9		B_2 8 2		
V	15 04				B_1 7 0		B_2 7 1	
VI	15 04					B_1 6 5		B_2 7 1
VII	15 00						B_1 6 8	
VIII	15 03							B_1 6 4

procedures as being responsible for the differences in test performance Thus we may attribute the difference between 6 4 achieved in the 63d day by Group VIII and 10 7 achieved by Group II to the fact that the latter group had previously taken the test Moreover, the effect of the temporal position at which the test is administered may be gauged by the achievement of the various groups For Group VI we note that the effect of the first testing on the second is negligible Here the first test was taken on the 21st day For Group IV is seen the mean performance on the 7th day without there having been a previous reaction to the test, by comparing this with the mean performance of Group II we may see the effect of a test response levied immediately after learning Various comparisons of this kind can be made, all of which show that the effect of the first test response on the second decreases as the time be-

[29] H F Spitzer, "Studies in Retention," *Journal of Educational Psychology*, 1939, Vol 30, pp 641–656

tween learning and the securing of the first test response increases Groups I and II, who took the test immediately after learning, benefited most from the test response Spencer, who repeated the conditions of this investigation, with the exception that the learning material was presented orally, confirmed Spitzer's results [80] The significance of these results lies not so much in showing that the exacting of test responses has review

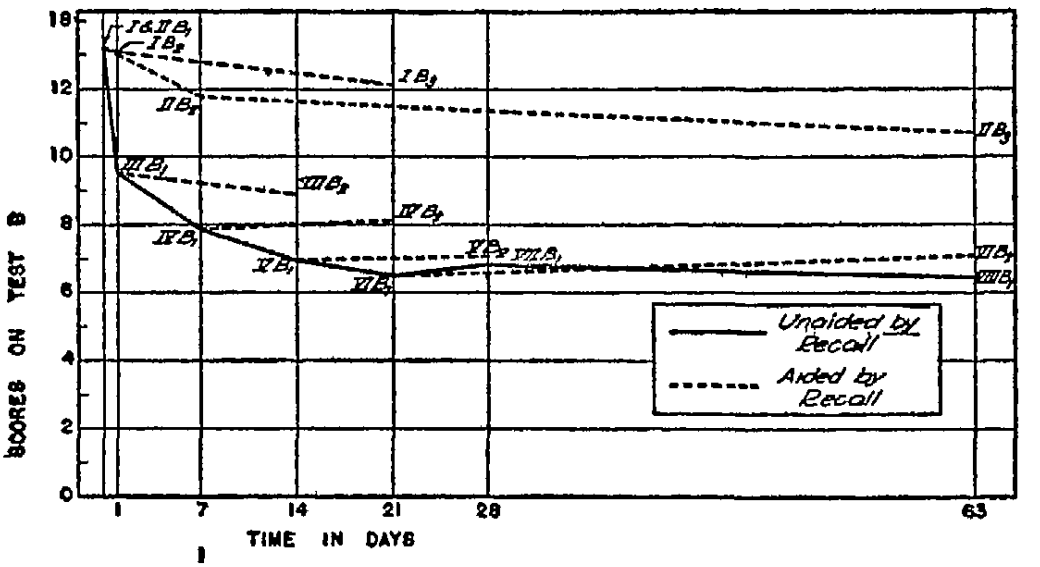


FIG 12 CURVES OF RETENTION FOR THE ENTIRE POPULATION WHEN THE AMOUNT RETAINED IS EXPRESSED IN RAW SCORES

value, although this is important, as in showing that the effectiveness of symbolical review is inversely related to the time elapsing between learning and reviewing

Sones and the author carried out an investigation the design of which was, first, to compare a test response and a rereading with respect to their review value and, second, to determine whether or not the effectiveness of rereading review also varies with the temporal position at which it is introduced [81]

This experiment compared the two *kinds* of review at three *temporal positions* The review periods took place on the 1st and 3d days — Position I, on the 8th and 15th days — Position II, and on the 15th and 17th days — Position III The subjects,

[80] E M Spencer, "The Retention of Orally Presented Materials," *Journal of Educational Psychology*, 1941, Vol 32, pp 641–655

[81] A M Sones and J B Stroud, "Review, with Special Reference to Temporal Position," *Journal of Educational Psychology*, 1940, Vol 31, pp 665–675

seventh grade pupils, were divided, within each of 48 classes, into six randomly selected methods groups The methods groups were compared by scores achieved on a 40-item, 4-response criterion test administered in all cases 42 days after the original learning exercise Methods Group I reread at Position I, III at Position II, and V at Position III, Methods Group II responded to a multiple-choice test at Position I, IV at Position II, and VI at Position III

This experiment corroborated Spitzer's in finding that the review value of a test response decreases as the time between learning and its induction increases On the other hand the effectiveness of rereading review increased slightly, but not significantly, under the same conditions At the first position, the test response was reliably more effective than rereading At the last position, rereading was reliably more effective than the test response At the intermediate position rereading had a slight advantage over the test response, but the difference is not significant

The foregoing investigations confirm the prediction of Lyon that review exercises should be introduced soon after learning for optimal benefit, if such exercises are symbolical in character Since it is true that symbolical review decreases in effectiveness as some function of elapsed time — a condition that also should apply to lecture and reading notes — we may see what high degree of scholastic folly there is in depending upon another's notes for one's education The foregoing investigation is in agreement with results obtained by Peterson, *et al*, who used quite a different procedure [82]

In the foregoing investigations, learning was not carried to a very high level With material learned to a relatively high level, as to a criterion of one or more correct repetitions, like the typical procedure in memory experiments, it is possible that review by what we have called reimpression would also be affected by temporal position There is a suggestion of this in

[82] Peterson, H A, M Ellis, N Toohill, and P Kloess, "Some Measurements of the Effects of Review," *Journal of Educational Psychology*, 1935, Vol 26, pp 65–72

an investigation by the writer and Freeburne [83] This investigation had, as one of its objects, the testing with memory materials (paired adjectives) – learned to a criterion of one correct repetition – the findings of Sones and the writer, with prose substance The latter material was incompletely learned by all, and learned very little by some Learning and retention were measured by means of an objective test, and the taking of such a test constituted the medium of symbolical review In the experiment by the writer and Freeburne the more rigorous conditions of the laboratory were maintained Symbolical review was mediated by direct recall

Review by recall one day after learning yielded a mean score of 9 0 items (out of 14), two days afterward Review by reimpression yielded a mean score of 10 4 under otherwise similar conditions Review by recall 14 days after learning yielded a mean score of 3 1, two days afterward, whereas review by rereading after a like lapse of time yielded a mean score of 8 1, likewise two days afterward

In large measure, this investigation confirms for laboratory material, learned under laboratory conditions, previous results on prose substance, learned under school conditions It is of special significance that an objective test response functions as a review medium in quite the same sense as does direct recall, and that the general conditions of its effectiveness are the same [84]

While there is no question that review is valuable educational procedure, it should also be appreciated that there are inefficient, monotonous, and uninteresting methods of reviewing However, just as indefensible is the refusal to capitalize on this important principle of learning because it has been abused As previously indicated, it is seen at its best *when material previously learned is recalled, or, if need be, consulted anew, for purposes of attacking a problem to which it is*

[83] J B Stroud and M Freeburne, "Symbolical Practice," *Journal of Educational Psychology*, 1942, Vol 33, pp 65–71

[84] *Cf* G Raffel, "The Effect of Recall on Forgetting," *Journal of Experimental Psychology*, 1934, Vol 17, pp 828–838

pertinent The so-called integrated course of study provides a feasible and effective procedure for implementing review, although for reasons already stated these advantages are not fully realized automatically

Degree of learning Again we return to the classical experiments of Ebbinghaus for our first, and perhaps our best, investigation of the relationship between retention and the degree of learning In this experiment he learned, to varying degrees, as represented by 8, 16, 24, 32, 42, 53, and 64 readings, 70 double lists of nonsense syllables composed of 6 series of 16 syllables each, and tested himself for retention 24 hours afterward in each case The per cent saved, is shown as follows, for the various amounts of practice

No readings	8	16	24	32	42	53	64
Per cent saved	8	15	23	32	45	54	65

In other experiments Ebbinghaus required about 30 readings, on an average, to commit lists of 16 syllables to a criterion of two perfect repetitions The foregoing results show, with respect to the conditions under which they were obtained, virtually a one-to-one relationship between the number of repetitions and scores earned 24 hours later

(1) *Over-learning* The work pertaining to the relationship between retention and degree of learning is generally treated under the heading *over-learning* This term is employed in psychology to signify any amount of learning or practice exacted of the subject over and above that required to reach a criterion

It goes without saying that material well learned is remembered longer and more effectively than material poorly learned There is, however, no *a priori* reason why a given number of repetitions levied after a list has been committed to memory should have the same effectiveness as an equal number imposed in the interest of reaching a criterion, nor is there any way of predicting, except on the basis of empirical data, whether successive over-learning repetitions increase or decrease in effectiveness

Krueger's investigations of over-learning are perhaps the

most systematic of any in the field [35] In his investigations learning to a criterion is taken as 100 per cent, and additional trials are expressed in the appropriate percentages of 100 The levying of trials beyond the criterion to a number equal to one-half the number required to reach the criterion is designated as 150 per cent learning, twice the number required to reach the criterion, 200 per cent learning His subjects learned lists of 12 monosyllabic nouns by the method of anticipation [36]

The relative effectiveness of the three degrees of learning was measured by retention tests made by the methods of anticipatory recall and relearning exacted at varying intervals of time after learning as follows 1, 2, 4, 7, 14, and 28 days The subjects learned different lists of words for each experimental condition Thus as an additional feature he was able to determine the effect of the length of interval between learning and testing for retention upon the relationship between amount of overlearning and amount retained Table XLIV summarizes, in part, the findings The fact that the lists were fairly uniform

[35] W C F Krueger, "The Effect of Overlearning on Retention," *Journal of Experimental Psychology*, 1929, Vol 12, pp 71–78 W C F Krueger, "Further Studies in Overlearning," *Journal of Experimental Psychology*, 1930, Vol 13, pp 152–163

[36] In the method of anticipation, much used in psychological laboratories, the items are presented one at a time by means of some exposure apparatus, such as a memory drum Subsequent to the presentation of the complete list, the first item is again exhibited, whereupon the subject is asked to anticipate the second item within the regular exposure time, usually from 2 to 4 seconds Whether or not the subject is successful in reproducing the second item within the time limit, the second item is shown, which is a signal for the anticipation of the third The third in turn becomes a signal for the anticipation of the fourth, and so on until the list has been completed The anticipation is vocal When the last anticipatory attempt is made, the items in the list are exposed again, as before, without vocal anticipation Experimentally, this is known as presentation The anticipatory trials constitute one form of recall Thus, under the usual experimental arrangement, presentation and recall alternate until the criterion of learning, commonly one or two correct trials, has been reached Thus it happens that the odd-numbered trials become presentations and the even-numbered, recalls

When an experimental arrangement involves learning to a criterion and when, as is usually the case, the number of trials required to attain criterial learning becomes the measure of learning efficiency, it is customary to alternate presentation and recall trials in the manner just described, regardless of the experimental method used

TABLE XLIV

EFFECT OF OVER-LEARNING ON RETENTION

Interval in Days	Degree of Learning (%)	Trials Required to Learn Lists	Trials Required for 100% Learning	Per Cent Saved
1	100	4 25	4 25	21 73
1	150	7 00	4 40	36 15
1	200	8 86	4 43	47 10
2	100	4 40	4 40	13 40
2	150	7 40	4 85	33 45
2	200	9 60	4 80	42 05
4	100	4 55	4 55	3 40
4	150	7 30	4 70	29 75
4	200	9 20	4 60	32 30
7	100	4 45	4 45	1 75
7	150	6 30	4 15	23 15
7	200	9 10	4 55	27 55
14	100	4 40	4 40	1 65
14	150	6 95	4 50	20 80
14	200	8 50	4 25	25 45
28	100	4 65	4 65	1 50
28	150	7 40	4 85	20 50
28	200	9 50	4 75	25 10

in difficulty is shown in Column 4 Column 5 gives the retention, in per cent saved by the method of relearning, at each interval and for each degree of learning

These results show quite clearly that over-learning enhances retention, but it is difficult to assess the precise relationship When relearning is induced one day after learning, the three degrees of learning are about equally efficacious trial for trial However, for longer intervals between learning and relearning, 50 per cent over-learning was more efficacious per trial than learning, and 50 per cent over-learning had a slightly greater per-trial effectiveness than 100 per cent over-learning In terms of absolute differences in percentage points the advan-

tage goes likewise to 150 per cent learning, and by a wide margin The differences between 150 and 100 per cent average about 20 points, those between 200 and 150 per cent, about six points [37]

(2) *Over-learning in school* In our attempts to implement over-learning in school we should not imitate the procedures of the psychological laboratory As indicated in a previous chapter, the laboratory worker is interested in general principles of learning He is not trying to show how they may be applied in school We may depend upon the laboratory for information about the effectiveness of over-learning and the conditions upon which this effectiveness depends, but we should contrive to secure the advantages thereof by means that are more in line with other principles of teaching and learning

There is a great deal of over-learning in school as a natural consequence of instructional procedures In drill work, for example, over-learning is accomplished with respect to the first items learned while other items are being mastered The opportunity for over-learning is present in all reading, writing, ciphering, and spelling, both in school and out As a matter of fact, there is no clear line of demarcation between over-learning and review, except for a difference in time Actually, review, while it envisages more than over-learning, is one means of securing over-learning

In a very general sense there probably is some degree of over-learning in connection with the prosecution of all courses of study, as the pupil actually makes use of previously learned information in attacking new learning situations For various reasons this form of over-learning has much to recommend it It avoids monotony, it provides for practice in a useful situation, and conditions for the operation of the "re-enforcing mechanism" are favorable Attempts to "overpower" the learner by sheer dint of enforced repetition are likely to be relatively unproductive, unoriginative, and uninteresting In

[37] *Cf* N B Cuff, "The Relation of Overlapping to Retention," *Contributions to Education*, No 43 Nashville George Peabody College for Teachers, 1927 C W Luh, *op cit* E C Tolman, "The Effects of Underlearning upon Short and Long Time Retentions," *Journal of Experimental Psychology*, 1923, Vol 5, pp 466–474

endorsing over-learning we need not commit ourselves to laborious drill, and, by the same token, we need not fail to take advantage of over-learning because of our disaffection for excessive drill The advantages that accrue from such educational methods as *integration* and *correlation* are owing in no insignificant degree to their implementation of over-learning

From the discussion in Chapter XIII it should be clear that one effort to implement over-learning should be studiously avoided, namely repetitive reading of lessons The discussion there of the effect of two or more consecutive presentations and of extensive and intensive study should be adequate to the present problem

Relationship between acquisitive and retentive abilities The problem involved here may be broken down into the following two questions

1 How do slow and fast learners compare in retention of material learned to a criterion, that is, when degree of mastery is experimentally equal and amount of practice, as between the fast and slow learners, is unequal?

2 How do good and poor learners compare with each other in the retention of learned material when practice is equal and degree of mastery unequal? Also, what is the relationship between amount learned in a given number of practices and the *percentage* retained?

(1) *Learning constant, practice variable* The subject who requires 30 trials to reach a criterion has an opportunity to do more over-learning of the initially learned items in a list than does a subject who requires but 10 trials, for example Despite this, the evidence stands against the slow learner's having any superiority in retention over the fast learner From which we may infer that trial for trial the over-learning done by the fast learner is more effective than that done by the slow learner However, if the saving method is used in reckoning the retention of fast and slow learners, a simulated advantage goes to the latter, even though they require, as they usually do, more trials to relearn For example, if subject *A* acquires a list in 16 trials and relearns it in 6 trials at some distant date, his saving score will be 62 5 per cent If *B* acquires the same list

in 10 and relearns it in 5, his saving score will be but 50 per cent, though his relearning score is superior to *A*'s Saving scores should not be used in connection with this problem

Muller and Schumann obtained a positive relationship between the time taken to learn a list of syllables and that taken to relearn to same criterion 24 hours later [38] Ogden obtained comparable results with both nonsense and meaningful material " rarely does the fast learner require more time for relearning than does the slow learner, and usually requires less " " The fast learner, then, has the advantage, learning, in the first place, in the shortest time, and relearning what he has forgotten in the shortest time " [39]

Pyle found that fast learners are superior in immediate memory for words, objects, pictures, syllables, and connected thought passages This is, of course, a necessary outcome, since the *sine qua non* of fast learning (memorization) is good immediate memory One is a fast learner by virtue of good immediate memory

Pyle also observed that differences in retention scores, when material had been learned to a criterion, were much smaller than the differences in the number of trials required to reach the criterion This finding on the part of Pyle confirmed an earlier observation made by Ogden The latter found that individual differences in relearning time were much smaller than those in learning time Pyle found that individual differences in amount recalled were much smaller than the differences in trials required to learn For example, he obtained a ratio of five to one in trials required to learn to a criterion, and a ratio of four to three between the best and poorest recall score

The results of Lyon's investigation, presented in Table XLV, may stand as a summary of the foregoing paragraphs [40] His subjects learned to a criterion the following materials digits, syllables, words, prose, and poetry It is seen that the saving

[38] From W H Pyle, " Retention as Related to Repetition," *Journal of Educational Psychology*, 1911, Vol 2, pp 311–321

[39] Pyle, *ibid*

[40] *Op cit*, p 141

TABLE XLV

RELATION OF QUICKNESS TO RETENTIVENESS

	Time of First Learning, Min	Time of Re-learning, Min	Per Cent of Time Saved	Per Cent Recalled
40 Grammar School Girls, Modal Age, 14				
Average Upper Half	13 2	5 0	60	37
Average Lower Half	20 1	6 9	64	28
24 Trade School Boys, Modal Age, 16				
Average Upper Half	11 4	4 2	59	35
Average Lower Half	19 2	7 3	60	26
60 High School Students Both Sexes Modal Age, 17				
Average Upper Half	12 4	4 8	62	39
Average Lower Half	21 5	7 0	65	31
132 Normal College Women Students Modal Age, 21				
Average Upper Half	11 2	4 0	61	39
Average Lower Half	17 8	6 4	65	31
24 Asylum Attendants Both Sexes Modal Age, 25				
Average Upper Half	14 1	5 2	58	35
Average Lower Half	18 3	7 2	62	28
12 Clerks and Businessmen Modal Age, 30				
Average Upper Half	12 2	4 4	61	37
Average Lower Half	20 0	7 1	67	30
16 Graduate Students and Professors Men Modal Age, 32				
Average Upper Half	11 1	3 8	61	41
Average Lower Half	16 9	6 1	63	33

The interval between first learning and relearning was, in the groups included in this table, one week for digits and nonsense syllables, and ten weeks for words, prose, and poetry

scores favor slightly the slow learners and that relearning and per cent scores favor the quick learners

(2) *Practice equal, learning unequal* The condition implied in this heading more nearly meets that which the teacher

has in mind when he raises the question of the relationship between acquisitive and retentive ability Gamble, in an extensive investigation, found a "marked correlation between quickness of learning and tenacity of impression," the magnitude of the coefficient not being given Her subjects, 350 college students, were given four (in some cases five) presentations each of three kinds of material Retention tests were made five, or six, weeks afterward [41]

Thorndike obtained a correlation of 55 between the immediate reproduction of a list of words presented once auditorially and reproduction on the following day [42] Gates found an average correlation of 82 between immediate scores and scores made 3 or 4 hours later on connected biographical material, and 70 on syllables, by grade school pupils He also obtained average correlations of 41, biographical material, and of 39, syllables, between immediate recall scores and the proportion of those scores earned after the interval [43] Henderson's [44] results for the learning and retention of connected trains of thought point in the same direction, as do those of Dietze and Jones [45]

An investigation published by Norsworthy in 1912 attacked the problem in an interesting way She caused groups of college students to learn a great many lists of German-English pairs — consisting of German words and their English equivalents, 10 pairs per list Each student studied 20 minutes per day for 5 consecutive days [46] Within this period every stu-

[41] E Gamble, reported by D O Lyon, *Memory and the Learning Process,* pp 89–91 Baltimore Warwick and York, 1917

[42] E L Thorndike, "The Relation between Memory for Words and Memory for Numbers, and the Relation between Memory over Short and Memory over Long Intervals," *American Journal of Psychology,* 1910, Vol 21, pp 487–488

[43] A L Gates, "Correlations of Immediate and Delayed Recall," *Journal of Educational Psychology,* 1918, Vol 9, pp 489–496

[44] E N Henderson, 'A Study of Memory for Connected Trains of Thought," *Psychological Monographs,* 1903, Vol 5, Whole No 23

[45] A G Dietze and G E Jones, "Factual Memory of Secondary School Pupils for a Short Article Which They Read a Single Time," *Journal of Educational Psychology,* 1931, Vol 22, pp 586–598, 667–676

[46] N Norsworthy, "Acquisition as Related to Retention," *Journal of Educational Psychology,* 1912, Vol 3, pp 214–218

dent had memorized at least 200 pairs, some as many as 800 or 900 The lists were relearned twice after 2-day intervals each English equivalents known at the outset, as determined by pre-test, were subtracted from each student's score After the study periods were over, 50 German words, selected at random from the list of 200 German-English pairs which every student had committed to memory, were used as a retention test She obtained a correlation of 41 between the total number of pairs memorized and the per cent of the 50 test pairs remembered The best ninth, whose members committed a minimum of 700 pairs, retained 76 per cent of the 50-word sample, while the poorest ninth, whose maximum was less than 300 words, retained but 46 per cent

A well-planned investigation conducted by Gillette has corroborated in large measure all of the aforementioned investigations This investigation is also of interest in that it found that fast learners both retain more and forget more than do slow learners Thus we may conclude that learning ability and retentive ability are positively related [47]

Intelligence There is but little room for skepticism regarding the overall relationship between intelligence and retentive ability We know that intelligence and learning are closely related, by definition One of the accepted definitions of intelligence is *ability to learn* We have seen that learning and retentive ability are related Another definition of intelligence is *ability to profit from past experience*, or, *to utilize past experience in meeting new situations* This implies transfer of training, which in turn implies retention in a functional sense Moreover, as is seen in the subsequent chapter, transference is positively related to intelligence Thus it should follow that intelligence is positively related to retentiveness This prediction is corroborated by empirical data

Gates obtained an average correlation of 44 between teachers' estimates of intelligence of grade school pupils and the percentage of previously acquired sense material retained after

[47] A L Gillette, "Learning and Retention, a Comparison of Three Experimental Procedures," *Archives of Psychology*, 1936, Vol 28, Whole No 198

3 to 4 hours, and an average correlation of .35 with the same variables for nonsense syllables [48] Lee correlated intelligence test scores with immediate and delayed retention of pictures, words, forms, and syllables [49] Obtained correlations between test intelligence and recall and recognition scores are shown in Table XLVI The magnitude of the coefficients is certainly not great, yet for a single exposure period of only 50 seconds one would not expect it to be overly high [50]

TABLE XLVI

CORRELATIONS BETWEEN TEST INTELLIGENCE AND IMMEDIATE AND DELAYED RECALL

Time Interval	Material	Recall	Recognition
30 seconds	pictures	.58	.30
" "	words	.55	.36
" "	forms	.23	.13
" "	syllables	.16	.32
24 hours	pictures	.46	.34
" "	words	.47	.24
" "	forms	.27	.26
" "	syllables	.29	.23

Age It is known that ability to learn increases with age from childhood to maturity, that mental age similarly increases, and that both decline in middle and old age (Chapter XII) Moreover, it is known that learning ability and *M A* are positively correlated, and that learning ability and retentive ability are positively correlated It should follow, therefore, that retentive ability should reach a maximum in the late teens or

[48] *Op cit*

[49] A L Lee, "An Experimental Study of Retention and Its Relation to Intelligence," *Psychological Monographs*, 1925, Vol 34, Whole No 157

[50] *Cf* J A McGeoch, "The Fidelity of Report of Normal and Subnormal Children," *American Journal of Psychology*, 1925, Vol 36, pp 434–445 T H Pear and S Wyatt, "The Testimony of Normal and Mentally Defective Children," *British Journal of Psychology*, 1914, Vol 6, pp 387–419

early twenties and should decline somewhat during middle age and with greater proclivity during senescence It is possible, of course, that there are specific differentiative effects of age on retention In which case the decline in retentive ability would be greater than the decline in learning and *M A* In fact such appears to be the case

In a special handling of Henderson's data Thorndike *et al* paired adult and grade school children in amount of connected prose material learned under specified conditions Scores on retention tests made four weeks later showed that the adults had forgotten more [51]

Gilbert has published recently an illuminating article on this general subject She compared 174 adults, aged 60 to 69 years, with an equal number of young adults, aged 20 to 29 years, on several different tests [52] The two groups were equated on the vocabulary test of the 1916 revision of the Stanford-Binet scale. On all of the measurements fully significant differences in retention were obtained in favor of the younger group [53]

Amount of material As is seen in Chapter XIII, the time required to commit a list of syllables or numbers increases at an accelerating rate as the length of the list increases We now inquire what the relationship is between length of list and retention Ebbinghaus found that the per cent saved, as determined by the relearning method, increased as the length of list (of syllables) increased Lists of three different lengths were relearned daily for five consecutive days The number of repetitions required to learn (I) and relearn on each of five days, (II to VI) together with the per cent saved, are shown in Table XLVII [54]

Henmon confirmed Ebbinghaus' results with respect to the

[51] E L Thorndike, *et al*, *Adult Learning*, pp 301–312 New York The Macmillan Co, 1928

[52] J G Gilbert, 'Memory Loss in Senescence," *Journal of Abnormal and Social Psychology*, 1941, Vol 36, pp 73–86

[53] *Cf* J G Gilbert, "Mental Efficiency in Senescence," *Archives of Psychology*, 1935, Vol 27, Whole No 188 E B Potwin, 'Study of Early Memories," *Psychological Review*, 1901, Vol 8, pp 596–601

[54] F H Ebbinghaus, *op cit*, pp 82 ff

relationship between length (of syllables, poetry, and prose) and saving scores,[55] as did Robinson and Heron for syllables.[56]

The experimental data point to the conclusion that retention is positively related to the quantity of material learned. This probably comes about by virtue of the fact that the amount of over-learning increases directly with the length of list.

TABLE XLVII

RELATIONSHIP BETWEEN LENGTH OF LIST AND SAVING SCORES

Length of List	Average No. of Repetitions Required to Relearn on Consecutive Days and Per Cent Saved					
	I	II	III	IV	V	VI
12 syllables						
Repetitions	16.5	11.0	7.5	5.0	3.0	2.5
Per cent saved		34	55	70	82	85
24 syllables						
Repetitions	44.0	22.5	12.5	7.5	4.5	3.5
Per cent saved		49	72	83	90	92
36 syllables						
Repetitions	55.0	23.0	11.0	7.5	4.5	3.5
Per cent saved		58	80	86	92	94

The educational importance of the foregoing findings is difficult to assess. One cannot justify a recommendation of longer assignments, since longer lessons are more difficult to master. Moreover, lessons are not, as a rule, learned to a criterion, in which case greater over-learning of longer assignments is not present. In fact, there is nothing in the foregoing results to indicate that pupils remember a greater proportion of long

[55] V. A. C. Henmon, "The Relation between Learning and Retention and Amount to Be Learned," *Journal of Experimental Psychology*, 1917, Vol. 2, pp. 476–484.

[56] E. S. Robinson and W. T. Heron, "Results of Variations in Length of Memorized Material," *Journal of Experimental Psychology*, 1922, Vol. 5, pp. 428–448.

lessons than of short ones The length of assignment will have to be dictated by other policies [57]

Character of materials (1) *Meaningfulness* The question of meaningfulness of material is discussed in Chapter XIII The experimental data apply as well to retention as to learning Materials that are easily learned, practice being constant, tend to be well retained Material high in associative value is for that reason comparatively easy to learn and for the same reason is easily recalled, relearned, or recognized afterward Logical material, material capable of meaningful organization or reduction to some kind of system, comes within the operations of transfer of training, operations that facilitate recall as well as learning In the case of meaningful material the necessary cue stimuli are more easily manipulated (Chapter XI)

(2) *Affective quality* The influence of the affective tone of material is also discussed in Chapter XIII It is unnecessary to cite again the experiments relating to the problem Suffice it to say the experiments, with substantial unanimity, have shown that the retention value of pleasantly experienced material is higher than that of unpleasantly experienced material and that the retention value of both is much higher than that of affectively indifferent material

(3) *Skills and symbolical materials* One occasionally encounters the statement that acts of skill, like skating, typing, and golfing are retained more effectively than verbal or other symbolical materials There is some truth in these commonsense observations But on the whole the comparisons are such as to preclude generalization In the first place such acts as skating and swimming are in large measure reducible to something comparable to a general principle There is not much to remember In the second place such acts are usually practiced

[57] C B Key, "Recall as a Function of Perceived Relations," *Archives of Psychology*, 1926, Vol 13, Whole No 83 D A Laird, H H Remmers, and L J Peterson, "The Experimental Study of the Influence of Organization of Material for Memorizing upon Its Retention," *Journal of Experimental Psychology*, 1923, Vol 6, pp 69–81 H N Peters, "The Relationship between Familiarity of Words and Their Memory Value," *American Journal of Psychology* 1936, Vol 48, pp 572–584 S Pan, "The Influence of Context upon Learning and Recall," *Journal of Experimental Psychology*, 1926, Vol 9, pp 468–491

to a high degree Moreover, many of them may be performed approximately in a variety of ways The verbal activity of speaking is retained quite as well as the manual activity of writing

Fair comparisons between the retention of motor acts and symbolical materials can be made only in the event both are practiced equally and are actually comparable as to length, complexity, amount of detail and in the degree to which they permit of meaningful organization and the operation of transfer of training When such conditions are kept constant there is actually comparatively little difference between these two classes of material [58]

The influence of set to remember It is well known that an active set to learn is more productive of learning than a set of passive receptivity Peterson found that the difference between the two sets was greater after a lapse of time than when the comparison was made immediately after learning [59] This finding suggests that an active learning set also influences retention favorably The present problem is chiefly concerned with the effect of learning with the intent to learn and *remember* as compared with a set to learn Boswell and Foster found that learning with the set to retain resulted in higher retention scores than learning under an immediate-recall set [60] Thisted and Remmers studied the effect of long and short time sets They found, for example, that retention after two weeks was greater under a two-week set than under a one-day set [61]

[58] J A McGeoch and A W Melton, "The Comparative Retention Values of Maze Habits and of Nonsense Syllables," *Journal of Experimental Psychology,* 1929, Vol 12, pp 392–414 F N Freeman and E M Abernethy, "New Evidence of the Superior Retention of Typewriting to that of Substitution," *Journal of Educational Psychology,* 1932, Vol 23, pp 331–334

[59] J Peterson, "The Effect of Attitude on Immediate and Delayed Reproduction A Class Experiment," *Journal of Educational Psychology,* 1916, Vol 7, pp 523–532

[60] F P Boswell and W S Foster, "On Memorizing with the Intention Permanently to Retain," *American Journal of Psychology,* 1916, Vol 27, pp 420–426

[61] M N Thisted and H H Remmers, "The Effect of Temporal Set on Learning," *Journal of Applied Psychology,* 1932, Vol 16, pp 257–268

Effect of bias toward the material The facts relative to the comparative retention scores earned on pleasant, unpleasant, and indifferent material are contrary, or seemingly so, to the prediction of the Freudian (bidirectional) theory of memory However an interesting turn has been given the problem by the work of Watson and Hartmann,[62] Edwards,[63] and Seeleman[64] This work suggests that unpleasant material is more readily forgotten than pleasant and indifferent material only in the event there is *ego* involvement, in the event the material conflicts with an established *frame of reference*, that is, an attitude, a belief, a desire, and so on

Edwards' investigation was designed in part to serve as a check on the study of Watson and Hartmann In particular it was designed to test the following hypothesis, as formulated by Edwards "*Experiences which harmonize with an existing frame of reference will tend to be learned and remembered better than experiences which conflict with the same frame of reference*" He read a prepared statement on the New Deal, about 2000 words in length, to a group of college students One-half of the statements were pro-New Deal, the other half, anti-New Deal A test consisting of an equal number of items covering the favorable and unfavorable statements was administered afterward to three groups of subjects, one group favorable, another unfavorable, and the other neutral It turned out that the favorably disposed group learned and remembered more of the favorable than of the unfavorable statements, with the unfavorably disposed group the outcome was reversed They learned and remembered more of the unfavorable statements The differences are large and significant Seeleman's results are in accord

[62] W S Watson and G W Hartmann, "Rigidity of Basic Attitudinal Frame," *Journal of Abnormal and Social Psychology,* 1939, Vol 34, pp 314–336

[63] A L Edwards, "'Political Frames of Reference as a Factor Influencing Recognition," *Journal of Abnormal and Social Psychology,* 1941, Vol 36, pp 34–50

[64] V Seeleman, "The Influence of Attitude upon the Remembering of Pictorial Material," *Archives of Psychology,* 1940, Vol 36, Whole No 258

These results are in agreement with Edwards' hypothesis Whether or not they are to be taken as confirmation of the hypothesis is a matter of opinion The differences can be explained by the phenomenon of *set* Of course, set is here an instance of the frame of reference, but it need not involve conflict That is, the subject may simply have listened more actively to statements favorable to his bias

While the bearing the results have upon the Freudian theory of memory may be debatable, the results themselves are of first rate educational importance As such they offer additional evidence of the effect of affective attitudes upon learning and retention — a point discussed in Chapter VII

THE MEANINGFUL CHARACTER OF RETENTION

Attention has been called to the fact that learning is a selective process All of the elements in a learning situation are not learned with equal expediency As has been noted before also, learning is not a semi-passive process of having impressions from without imprinted upon the mental organs It is an active, dynamic process The learner transfers to a learning situation, be it a casual observation, a dramatic event, or a formal learning exercise in the laboratory, innumerable effects of past experience His more enduring habits and set, as well as motives that are operative at the moment, determine the aspects of the complex situation that will be dominant *Learning is an analytical process* As Woodworth suggests, a familiar figure is named, and an unfamiliar one compared with some other known figure or object, or the pattern is reduced to some kind of plan "The new = the old with a correction" [65]

Qualitative changes in retention Just as learning is a selective process so is retention, and selection in retention and forgetting is dictated by the same conditions as selection in learning There is an extensive literature on the quantitative aspects of retention and forgetting But there are some very important qualitative aspects also, aspects that reveal the

[65] R S Woodworth, *Experimental Psychology*, p 74 New York Henry Holt and Co, 1938

dynamic, intelligent characteristics of memory — a far cry from the envisagement of forgetting as a function merely of disuse

In his studies of memory, published in 1903, Henderson noted certain important qualitative changes in the materials reproduced by his subjects [66] These are grouped by him under three heads *regrouping, simplification,* and *introductions* In reproducing the ideas of short passages (about 150 words in length), which had been studied for three minutes, his subjects showed a tendency to bring together concepts of similar meaning even when presented in separate parts of the text — regrouping He observed two types of simplification condensation and modification Ideas that were repeated in the text tended to be mentioned but once in the reproductions, and words were substituted for phrases Modifications tended to be made by the fusion of two ideas, especially those having a somewhat common function In all, *meaning* appears to be a ruling factor in the reproduction of the passages 'Tyranny' may be rendered 'injustice', 'distressed the poor,' as 'trampled on the poor' These are examples of what Henderson calls introductions

Bartlett's "effort after meaning" is evident in all reproductions The sentence "There was once, in the eastern part of Egypt, a king, whose reign had long been a course of savage tyranny, long had he ruined the rich and distresssed the poor" may be reproduced in substance in various ways, but in all there is an attempt to reproduce the central ideas There is nearly always some degree of orderliness The reader may now convince himself of this by attempting to write the sentence without reading it again He may not be able to reproduce more than half the words appearing in the sentence There is likely to occur condensation, substitution of words, reorganization, and so on, but in all, the meaning of the sentence will tend to be preserved

The reader remembers a unit of thought Otherwise memory would be utterly chaotic, as for example in the following rendering of the sentence in question with 10 of the words

[66] *Op cit*

omitted, by chance selection "There was once in the eastern Egypt a whose had long been a of savage, had he rich and distressed the" In so far as could be predicted by the mere mechanical operation of *disuse*, reproductions something like this should be the rule

Bartlett's extensive investigations of recall and forgetting corroborate the foregoing [67] Recalling a trend of events is really a process of *reconstruction* The subject reconstructs the best pattern he can He constructs a meaningful story and one which he thinks fits the form or pattern of the original, as he understood it, or else says he does not remember He may fill in many details from his past experience as a process of assimilation, he adds details because they are logically necessary to reconstruct the pattern as he observed it or now understands it after reflecting upon it But in all the general pattern is preserved He attempts to reconstruct a coherent whole Otherwise, his remembering is simply unintelligent These observations accord with all of the experimental work on testimony

Qualitative changes in visual forms In the investigations of memory of visual forms, tests have usually been made by having the subjects draw, after varying intervals of time, previously observed figures As Woodworth points out, the product is a function of the subject's ability to draw, as well as of his memory of the figure Even so, certain discernible changes take place that are very illuminating and afford us further understanding of mental operations In the first place the reconstructed figures tend to be simpler and to show less detail than the observed figure If, however, there appears in the figure some very striking or unusual bit of detail, this tends to be somewhat exaggerated in later reproductions In addition to *simplification* there appears also a tendency to make *substitutions* and to alter the figures in the direction of a stereotype, some standard model which the observed figure resembles, the latter being a form of *assimilation* These three tendencies were observed by Philippe [68] in 1897 and by Kuhlmann in

[67] F C Bartlett, *Remembering A Study in Experimental and Social Psychology* Cambridge University Press, 1932

[68] J Philippe, "Sur les Transformations de Nos Images Mentales," *Review Philosophique*, 1897, Vol 43, pp 481–493

1906 [69] In addition, the latter noted a tendency toward *regularization*, such as equalizing lines not quite equal in the original, or making parallel, lines not quite parallel, or perpendicular, lines not quite perpendicular

Other investigators have noted a tendency for asymmetrical figures to be reproduced as symmetrical ones, or more generally, for poor figures to become better figures Possibly these are instances of assimilation and regularization, already noted [70]

McGeoch sees in the aforementioned qualitative changes in reproduction the operation of "two of the great classes of psychological events," *motivation* and *transfer* [71] He points out that recall, in its qualitative aspects, is influenced not only by the motives that are operating at the time of learning, but also by changes in the motivating conditions that may take place beween learning and later recall Thus, as he says, recall is influenced by the character of the material and its interaction with the motivating conditions of the subjects and the effects of their previous learning

ESSENTIAL CONDITIONS OF FORGETTING

The foregoing gives an account of several of the conditions in terms of which retention or forgetting varies The following paragraphs treat some of the conditions that have been regarded as essential – conditions in the absence of which forgetting does not take place Such conditions may be taken as theories of forgetting

Among the so-called essential conditions of forgetting the following have been proposed disuse, altered mental set, al-

[69] F Kuhlmann, "On the Analysis of the Memory Consciousness A Study in the Mental Imagery and Memory of Meaningless Visual Forms," *Psychological Review*, 1906, Vol 13, pp 316–348

[70] *Cf* W Brown, "Growth of 'Memory Images,'" *American Journal of Psychology*, 1935, Vol 47, pp 90–102 H R Crosland, "A Qualitative Analysis of the Process of Forgetting," *Psychological Monographs*, 1921, Vol 29, Whole No 130 F H Lewis, "Note on the Doctrine of Memory-traces," *Psychological Review*, 1933, Vol 40, pp 90–96 F T Perkins, "Symmetry in Visual Recall," *American Journal of Psychology*, 1932, Vol 44, pp 473–490

[71] J A McGeoch, *The Psychology of Human Learning An Introduction*, p 339 New York Longmans, Green and Co , 1942

tered context, and the effects of subsequent learning It is assumed that in order to forget, some change must take place, either in the stimulus or within the individual "The same situation will, in the same animal, produce the same response, if the same situation produces on two occasions two different responses, the animal must have changed" [72]

Disuse Disuse, as an empirical law, by which is meant that forgetting is among other things a function of elapsed time, is as firmly established as any fact of nature Some interval of time is a necessary condition to the normal processes of forgetting, and amount of forgetting is positively correlated with length of elapsed time

Time in and of itself does nothing It, however, is a necessary condition to most operations, such as growth, decline, erosion, corrosion, decay, and so on Time, of course, does not bring about these or any other conditions There is not, nor probably ever has been, any notion that time causes forgetting, although it is necessary to it

The empirical law of disuse does not stand or fall upon any particular theory of causation There has been a *theory* of disuse, so to speak, which assumed that forgetting is a more or less automatic process — a process that goes on spontaneously in periods of no practice This has been envisaged as a result owing to deterioration or fading of neurological impressions Such a fading could conceivably result from the normal processes of metabolic change This explanation does not now receive much attention

Altered mental set More or less by definition every stimulus produces some response and every response has, as a partial cause, a stimulus Recall and recognition, as well as all forms of symbolical activity and acts of skill, fit into this conception

In the course of normal mental life it frequently happens that two or more responses become connected with the same stimulus and that the same stimulus becomes connected with two or more responses It is a well-known fact that a given stimulus may call up different reactions on different occasions and that

[72] E L Thorndike, *Animal Intelligence*, p 241 New York The Macmillan Co , 1911

different stimuli may call up the same reaction To account for these facts Carr has stated two general conditions which he calls the *law of variable objective context* and the *law of variable subjective condition* (Chapter XI) Mental set is an instance of the latter This is made to include trains of thought, attitudes, moods, purposes, and the like If we think of recall or recognition as a response to a stimulus, we may, as an instance of the law of variable subjective condition, infer that the nature of such recall or recognition will be colored to some extent by the determining set of the moment

Altered context The law of variable objective context states that "the mode of responding to a given stimulating object tends to vary with all variations of the objective environment in which it is encountered" [78]

Alternation in mental set and in objective context may be said to account more particularly for the "vagaries of memory" It is a well-known fact that items may be recalled at one time and not at another However, these conditions may account for the so-called permanent losses, when enduring changes occur in context or mental set

Subsequent learning or retroactive inhibition Retroactive inhibition has become an important subdivision of experimental psychology and as such supports a considerable body of theory It has become systematically important

That interpolated learning — learning interpolated between primary (original) learning and recall — reduces the measurable retention of the primary material is amply attested by experimental facts, and several of the conditions upon which the extent of the influence depends are now known Retroactive inhibition has long since ceased to be a theory, it is an established fact However, facts become the bases of other theories Thus the phenomenon of retroactive inhibition is regarded as a theory of forgetting

Muller and Pilzecker, early workers in this field, advanced the theory that interpolated learning interferes with retention by disrupting certain maturing processes that were assumed

[78] H A Carr, "The Laws of Association," *Psychological Review*, 1931, Vol 38, pp 212–228

to go on in the nervous system following a learning exercise, a kind of setting-in process as it were This hypothetical process has been known as perseveration Since, if some such process were an actuality, the law of diminishing returns would probably operate, the amount of inhibition was alleged to be inversely proportional to the length of interval intervening between primary and interpolated learning Much of the research bearing the title *retroactive inhibition* has had as its object the testing of the theories pertaining to the operation of the phenomenon

(1) *Rest and sleep* Bigham appears to have been the first to study experimentally the effect of interpolated activity upon retention as he sought to compare retention in "filled" and "vacant" intervals [74] He found that retention of numbers, colors, forms, and words, presented both visually and auditorially, was somewhat better in vacant intervals than in filled intervals of the same length In the filled intervals his subjects read newspaper text, or listened to its reading Auditory filling was somewhat more detrimental to the retention of auditory content than to the retention of visual content, visual filling was slightly more detrimental to visual content than to auditory content — a finding that has been confirmed by Nagge Bigham concludes "The filling of the intervals hinders the memory"

The most frequently quoted of the early investigations is that of Muller and Pilzecker [75] These investigators found that interpolated learning of nonsense syllables and picture material exerted an inhibiting effect upon the retention of the primary syllable material, as gauged by comparing retention after a period of such interpolated learning with that after a period of interpolated rest

Continuous with the foregoing is the work of Jenkins and Dallenbach on retention in sleeping and retention in waking — continuous in the sense that sleeping represents a vacant inter-

[74] J Bigham, "Memory," *Psychological Review*, 1894, Vol I, pp 453–461

[75] G E Muller and A Pilzecker, "Experimentelle Beitrage zur Lehre vom Gedachtniss," *Zeitschrift fur Psychologie*, 1900 Erg I, pp 1–300

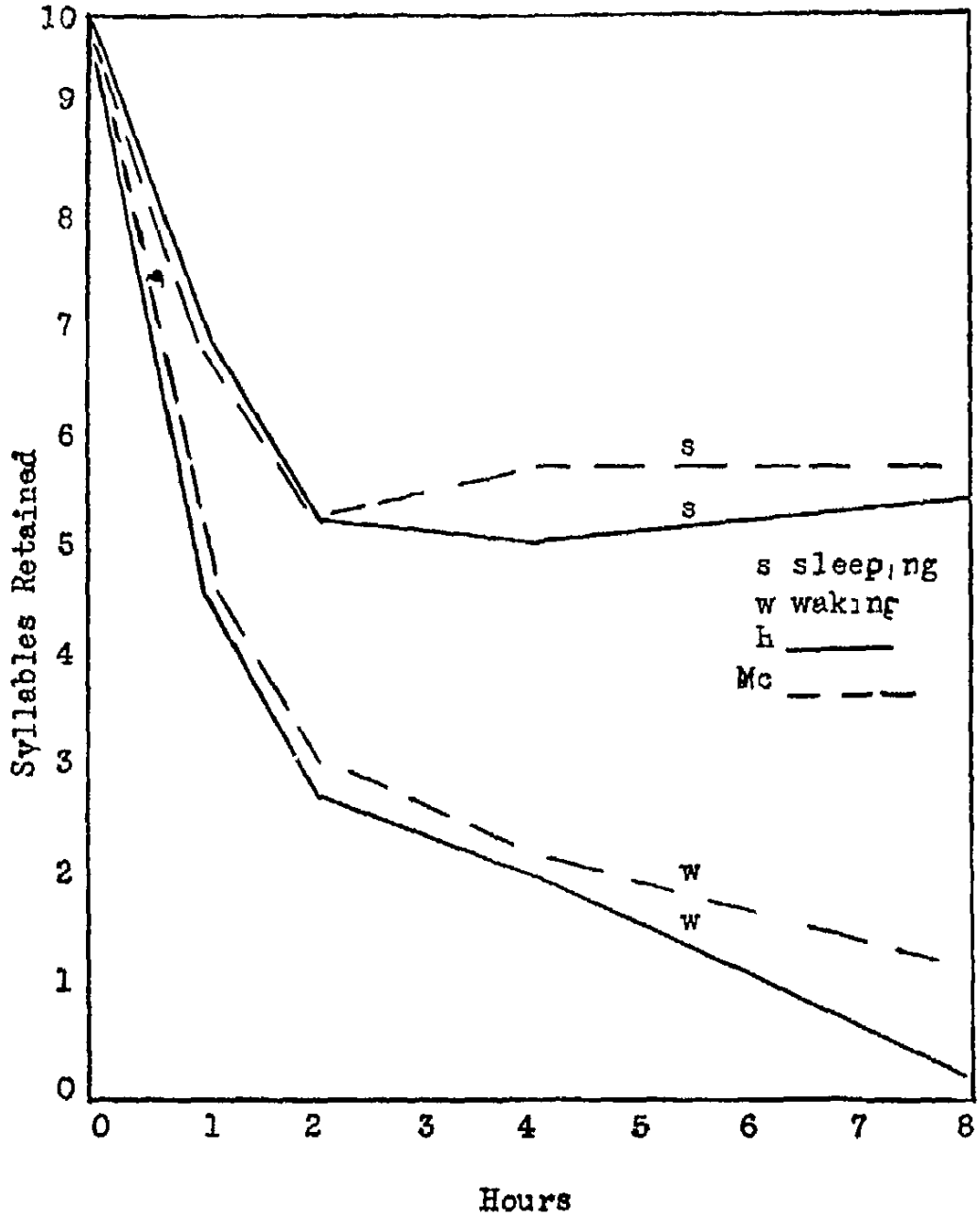


FIG 13 RETENTION DURING SLEEPING AND WAKING (JENKINS AND DALLENBACH)

val and waking, normal waking at least, a filled interval [76] The results, as depicted in Figure 13, show that retention in sleeping is considerably greater than retention in waking These findings have been confirmed by Van Omer [77] Webb has demon-

[76] J G Jenkins and K M Dallenbach, "Obliviscence During Sleep and Waking," *American Journal of Psychology*, 1924, Vol 35, pp 605–612

[77] E B Van Omer, "Retention after Intervals of Sleep and of Waking," *Archives of Psychology*, 1932, Vol 21, Whole No 137

strated the phenomenon of retroactive inhibition with maze material, for both human and animal subjects [78]

(2) *The condition of similarity* One of the first systematic investigations of the similarity factor was made by Robinson [79] In the first two of his experiments his subjects memorized lists of digits as the primary material Digits, consonants, multiplication problems, pictures, poetry, and narrative prose were

TABLE XLVIII

EFFECT OF INTERPOLATED ACTIVITY ON RECALL OF DIGITS

	Experiment I		Experiment II	
Interpolation	No Digits Recalled	Per Cent Errors	No Digits Recalled	Per Cent Errors
Four-place digits			15 3	33 8
Digits (serial)	15 4	27 5	18 2	22 4
Consonants	22 4	17 4		
Poetry	21 9	19 3		
Multiplication	22 1	15 7	20 6	21 5
Pictures			20 6	22 3
Reading	22 8	16 5	21 4	19 1

used as interpolated materials These materials were so chosen as to provide a condition of varying degrees of similarity, ostensibly, between the primary and interpolated materials The digits, consonants, and poetry were memorized, the prose material was read, and the pictures were observed The results are given in Table XLVIII in terms of recall scores and errors

Other investigations, especially those of Robinson [80] and of Gibson and Gibson [81] have confirmed the data presented in

[78] L W Webb, ' Transfer of Training and Retroaction," *Psychological Monographs,* 1917, Vol 24, Whole No 104

[79] E S Robinson, "Some Factors Determining the Degree of Retroactive Inhibition," *Psychological Monographs,* 1920, Vol 28, Whole No 128

[80] E S Robinson, "The Similarity Factor in Retroaction," *American Journal of Psychology,* 1927, Vol 39, pp 297–312

[81] E J and J J Gibson, "Retention and the Interpolated Task," *American Journal of Psychology,* 1934, Vol 46, pp 603–610

Table XLVIII The latter found that the amount of inhibition depends upon similarity of mental activity as well as upon similarity of material There are, of course, various kinds of similarity The effect of varying degrees of *formal* similarity has been investigated chiefly Similarity in meaning has received comparatively little attention

(3) *Degree of learning* McGeoch has found that the degree of learning of both the primary and the interpolated material is a factor in determining the amount of retroactive inhibition obtained His data suggest that within limits the more thoroughly the primary material is learned the less susceptible it is to the inhibiting effects of interpolated learning and that the more thoroughly the interpolated material is learned, the learning of the primary material being constant, the greater is the inhibiting effect [82]

(4) *Temporal position of interpolation* Robinson (1920) found the degree of retroactive inhibition to be independent of the temporal position at which the interpolated material was introduced Specifically, he compared the influence of learning a second list of numbers during the first five minutes of a 20-minute interpolated period with that of learning the list during the last five minutes of the period The subjects were occupied, during the remaining 15 minutes, in both conditions, with the reading of newspaper print He found the two positions to have equal effect Using longer interpolated intervals, McGeoch likewise found the amount of inhibition to be independent of the temporal position at which the interpolated material was introduced [83]

These experiments are rather crucial Obviously, perseverative tendencies should not persist indefinitely It has generally been assumed that they should disappear within a few minutes

[82] J A McGeoch, "The Influence of Degree of Learning upon Retroactive Inhibition," *American Journal of Psychology*, 1929, Vol 41, pp 252–262 J A McGeoch, "The Influence of Degree of Interpolated Learning upon Retroactive Inhibition," *American Journal of Psychology*, 1932, Vol 44, pp 695–708

[83] J A McGeoch, "Studies in Retroactive Inhibition II Relationships between Temporal Point of Interpolation, Length of Interval, and Amount of Retroactive Inhibition," *Journal of General Psychology*, 1933, Vol 9, pp 44–57

It also seems logical that they should diminish gradually We should expect, therefore, were perseveration a factor, that the introduction of interpolated learning immediately after the primary learning should produce greater inhibition than when introduced later The experimental findings to the contrary tend to invalidate the theory

(5) *The transfer theory* Some of the known facts of retroactive inhibition are at variance with the theory of perseveration Scarcely any of them could be predicted from the theory, and some of them actually are contradictory to predictions logically necessary to it The most significant instance of this sort is the fact that the amount of retroactive inhibition is independent of the temporal position of interpolated learning Perhaps, the fact that retroactive inhibition is a function of the similarity between the primary and interpolated material is also contrary to the prediction of the perseveration theory At least it shows that perseveration is not a sufficient theory

The transfer theory is not embarrassed by the fact that the amount of inhibition is independent of the temporal point of interpolation, and the fact that the amount of inhibition is a function of similarity and of amount of practice both of the primary and interpolated material is predictable from this theory One kind of deficiency in memory is simply erroneous responses It has been shown that one type of detrimental effect resulting from interpolated learning is the intrusion of responses belonging to the interpolated list in the recall of the primary list [84]

The presence of overt intrusions is direct evidence of the operation of transfer effects However, such intrusions are not to be taken as the only method of operation of transfer The interaction between the primary and interpolated lists is apparently broader in scope than that encompassed by overt intrusions As McGeoch suggests, both positive and negative

[84] F McKinney and J A McGeoch, "The Character and Extent of Transfer in Retroactive Inhibition Disparate Serial Lists," *American Journal of Psychology*, 1935, Vol 47, pp 409–423 A W Melton and J McQ Irwin, "The Influence of Degree of Interpolated Learning on Retroactive Inhibition and the Overt Transfer of Specific Responses," *American Journal of Psychology*, 1940, Vol 53, pp 173–203

transfer effects can operate without the actual carrying over of responses

McGeoch and his colleagues have put forward an engaging formulation of a transfer theory known as *reproductive inhibition* This phenomenon is really the converse of *associative inhibition* or the Mueller-Schuman law [85] The latter may be schematized as follows

KOR – LAV	*KOR – HUX*
ZUV – HEJ	*ZUV – TOB*
CIK – NOP	*CIK – MIJ*

in which the forming of the association *KOR – LAV* makes more difficult the forming of the association *KOR – HUX*, and so on for the other items in a list That is, when the association *A – B* has been formed it becomes more difficult to form an association between *A* and *C* In *reproductive inhibition* we have the condition in which the probability of the recall of *B*, *A* acting as a stimulus, is reduced by the formation of the intervening association between *A* and *C* [86]

(6) *Educational application* Now that retroactive inhibition has assumed an important explanatory position in forgetting, what can we recommend as an educational directive

[85] J A McGeoch, "Studies in Retroactive Inhibition VII Retroactive Inhibition as a Function of the Length and Frequency of Presentation of the Interpolated Lists," *Journal of Experimental Psychology*, 1936, Vol 19, pp 674–693 J A McGeoch, F McKinney, and H N Peters, "Studies in Retroactive Inhibition IX Retroactive Inhibition, Reproductive Inhibition and Reminiscence," *Journal of Experimental Psychology*, 1937, Vol 20, pp 131–143

[86] *Cf* S H Britt, "Retroactive Inhibition A Review of the Literature," *Psychological Bulletin*, 1935, Vol 32, pp 381–440 M E Bunch and M M Winston, "The Relationship between the Character of the Transfer and Retroactive Inhibition," *American Journal of Psychology*, 1936, Vol 48, pp 598–608 Sister M F L Lahey, "Retroactive Inhibition as a Function of Age, Intelligence, and the Duration of the Interpolated Activity," *Doctor's Thesis* Catholic University of America, 1937 J A McGeoch and F McKinney, "Retroactive Inhibition in the Learning of Poetry," *American Journal of Psychology*, 1934, Vol 46, pp 19–33 J W Nagge, "An Experimental Test of the Theory of Associative Interference," *Journal of Experimental Psychology*, 1935, Vol 18, pp 663–682 E J Swenson, *Retroactive Inhibition* Minneapolis University of Minnesota Press, 1941

that we could not have recommended before? Knowledge of one important condition, degree of primary learning — meaning that the more thoroughly material is mastered the less susceptible it is to retroactive inhibition — adds nothing of practical value, because it was already known that retention is positively related to the degree of mastery At one time in the history of retroactive inhibition it appeared that the findings had something to offer about the sequence of courses in the daily schedule One of the important conditions, degree of similarity between the primary and interpolated lists, plus the acceptance of the theory of perseveration (which carried the implication that inhibition varies inversely with the length of interval elapsing between primary and interpolated learning) gave rise to the recommendation that courses highly similar in content should not follow each other in the daily schedule This recommendation can, however, scarcely be defended in face of the fact that the amount of inhibition appears to be largely independent of the temporal position of interpolated learning

We cannot avoid teaching courses having similar content, and it does not seem to make much difference whether one follows the other immediately or after an interval of several hours However, our knowledge of retroactive inhibition, providing as it does an important explanation of forgetting, does enable us to make some recommendations that we could not make before we were in possession of this knowledge Since it is known that forgetting is due in part to interference or the intrusion of competing responses, we may by being thus forewarned arm ourselves to some extent against such interference

There is reason to believe that one can by conscious effort reduce interference between materials that are likely to conflict Let us suppose that a subject reads "The city of Florence, formerly the capital of Tuscany, now the capital of the province of Florence in the Kingdom of Italy, is situated 43° 46′ N, 11° 14′ E on both banks of the Arno River, which flows through a broad fertile valley enclosed between spurs of the Apennines", and subsequently reads "The city of Naples, formerly the capital of the Sicilies, now the capital of the province of Naples, in the Kingdom of Italy, is situated 40°

52′ N, 14° 15′ E, on the west bank of the Sabeto River, which here flows through a broad fertile valley enclosed between spurs of Mt Vesuvius and Mt Salerno" It appears that the reader can by noting, while reading the second statement, certain points of similarity and difference reduce the amount of inhibition the reading of this statement has on the first As he reads "The city of Naples, formerly the capital of the Sicilies," he may reflect "Florence, formerly the capital of Tuscany," or when reading that Naples is situated on the west bank of the Sabeto River, he may recall that Florence is situated on both banks of the Arno River, and so on

There is one final suggestion In school we are as interested in the retention of the interpolated material as in that of the primary material Naturally, thorough mastery of both helps But we are able to state the further condition that while up to a point the greater the degree of mastery of an interpolated list the greater is its inhibiting effect upon the primary list, beyond this point the inhibiting effects tend to diminish, and may actually facilitate retention of both lists [87] Moreover, data presented in the following chapter show that two competing habits, which at the outset interfere with each other — such that negative transfer results — may with sufficient practice cease to interfere one with the other and may actually become supplementary — with the result that negative transfer changes to positive

[87] A W Melton and J McQ Irwin, "The Influence of Degree of Interpolated Learning on Retroactive Inhibition and the Overt Transfer of Specific Responses," *American Journal of Psychology*, 1940, Vol 53, pp 173–203

CHAPTER XV

TRANSFER OF TRAINING MENTAL DEVELOPMENT THROUGH LEARNING

INTRODUCTION

By transfer is meant the operation (use or misuse) of learning in circumstances that are different to some extent from those under which the learning took place This is a necessary condition to all mental development that is not the specific consequence of physiological maturation Certain of the known conditions of transfer have explanatory value with respect to mental development The utilization of that which was learned in one situation in reacting to or in learning to react to another situation is transfer Since situations met are probably never exact replicas of any encountered previously, there is probably some degree of transfer in all reactions that reflect any degree of previous learning whatsoever Thus we may regard transfer as very nearly a universal psychological phenomenon Except for the operation of transfer no teacher could give instruction in a school subject and no pupil could profit from his schooling Transfer is the *sine qua non* of any generalized skill such as reading, writing, ciphering, and talking Transfer is not only a pervasive phenomenon, but it is also a necessary psychological concept In the latter respect it resembles motivation and effect, in that learning and mental development through learning cannot be explained without them

The fact of transfer is not a psychological problem, although some of the controversy over the nature of its operations may have given immature students the impression that the very existence of the phenomenon is debatable Nothing is farther from the truth Transfer as a unit of subject matter in psychology belongs to the experimental period and, for that matter, chiefly to the present century, although the principles involved

are implicit, and sometimes clearly stated, in apperception and in the formal steps of Herbart Some of the psychologically uninitiated in education have confused transfer with *formal discipline* The two categories represent two rival theories of mental development through learning, two rival theories of how education contributes to mental development

Formal discipline has meant that training is *formal* or general, not specific to the task in which the training occurred, nor limited to related tasks Discussion of the doctrine has been linked frequently with faculty psychology It is not to be supposed however that all who have employed the term *faculty* in psychological writing have endorsed the doctrine of formal discipline Locke, for example, ridiculed the thought that memory can be trained formally, yet frequently used the term *faculty*

Formal discipline is easily adapted to a framework in which the mind is supposedly analyzable into a number of faculties, such, for example, as memory, perception, will, and reasoning The practicing of a task like memorization of poetry, in terms of this linkage, not only brings about improvement in ability to memorize poetry, but also an improvement in the *faculty of memory*, with the result that all memorial activities are thereby improved When thus applied, formal discipline means the strengthening of a faculty through some performance that requires the use of it To repeat, the effect of such exercise is formal – general – with respect to the faculty as a whole, not specific to the activity in question The will, or will power, to take another example, can be strengthened formally by the appropriate exercising of it, as in electing, under the stimulus of self-improvement, to perform tasks that in the normal run of life are disagreeable, or in foregoing some highly agreeable activity Such are the implications of the doctrine of formal discipline

It is not entirely clear who were the protagonists of formal discipline, unless they were the poor schoolmasters of whom Scott, Goldsmith, Irving, and others have so genially complained, or indeed the academicians From modern educational writing the impression is gained that educational the-

ologists prior to our gaining of the true light in this century rather generally had groped in the abysmal darkness of formal discipline from the beginning It is remarkable, in view of all the fuss that has been made about it, that so few educational leaders seem to have been possessed with the idea Locke had no such notion, although he recognized that there were some who did, Herbart was troubled with the idea not in the least In fact, a follower of Herbart should have found the doctrine a distinct impediment Even so, it persisted at least to a degree In 1897 Sir John Adams still found occasion to write it off the books of educational theory In the present century educational psychology opened an attack upon the doctrine as if it were growing like weeds the world over

Teachers of academic subjects did at various times in the past, in attempting to justify their specialties, state objectives that were consonant with formal discipline Thus the study of geometry was alleged to strengthen the faculty of reason, grammar and language were said to develop the faculties of perception and thought If we may omit reference to faculties and simply state that virtuous application to them will increase one's ability to think clearly, such a statement is unobjectionable Two conditions in particular are requisite to good thinking, information and technique Subjects that supply them should further the ability to think, though they need not do so by virtue of strengthening some hypothetical faculty, in the sense that repeated flexing of a muscle increases its diameter

One can without difficulty find numerous utterances of college presidents and teachers of the so-called disciplinary subjects, a generation or so ago, which are capable of the construction that has been placed upon them — and such construction does not seem especially unfair [1] In extenuation it should be said that they were using the accepted language of their day In appraising their utterances it is unavoidable that our own mental set should influence our understanding of them The following, written in 1885, has been quoted as evidence of belief in formal discipline

[1] For a list of such citations see E L Thorndike, *Educational Psychology*, pp 82–84 New York Lemcke and Buechner, 1903

> The discipline of the mind, then, is the great thing in intellectual training, and the question is not, how much have I acquired? — but how have my powers been strengthened in the act of acquisition? [2]

Yet in 1932 the president of the Progressive Education Association wrote that progressive teachers are those "who actually see education as child development, and who will never lose sight of the fact that the process of learning is usually more important than the subject to be learned" [3] These two statements do not seem to be sufficiently dissimilar to warrant the branding of one as a pronouncement of outmoded principle and the hailing of the other as a principle so modern as to be a shade beyond its time Whatever the case may be, it is interesting to note that the old masters in education were singularly unencumbered by the shackles of formal discipline and we in this century cannot claim the credit of having been the first to discover the error

EMERGENCE OF THE PROBLEM OF TRANSFER

In the following paragraphs a brief account is given of some of the early experimental work in transfer of training, with the view to giving the student some appreciation of how transfer arose to a position of importance in experimental psychology and education We shall begin with the investigations of Thorndike and Woodworth [4] Their procedure was to test their subjects in one function, to provide practice in another function, noting the amount of improvement made, and then to retest them in the first function They worked with perceptual material Subjects were tested in ability to estimate the areas of geometric figures of varying size and design, were given intensive practice in estimating other areas of the same and

[2] D P Page, *Theory and Practice of Teaching*, p 97 New York American Book Co , 1885

[3] B P Fowler, "Progressive Education Enters a Second Phase," *Progressive Education*, 1932, Vol 9, pp 3–6

[4] E L Thorndike and R S Woodworth, "The Influence of Improvement in One Mental Function upon the Efficiency of Other Functions," *Psychological Review*, 1901, Vol 8, pp 247–261, 384–395, 553–564

different design, the amount of improvement in the practiced function being noted, and were retested on the original series This made possible the ascertainment of the effect of the practice in one series upon ability to judge the areas of another series

After training in rectangles of from 10 to 100 sq cm , it was found that the subjects made 61 per cent as much improvement in estimating rectangles of a different range as they did in the training series Training in rectangles produced 37 per cent as much improvement in triangles as that achieved in rectangles Other of their results are in accord with these, and together may be summarized as follows (1) improvement in ability to estimate areas of one kind and within one range of magnitude is not attended by equal improvement in ability to estimate those of different shape or magnitude, (2) a change in size alone decreases the amount of improvement, the decrease being roughly proportional to the amount of the change, (3) a change in shape alone or a change in shape and size produces a decrease in improvement, the decrease being roughly proportional to the amount of change " there is no inner necessity for improvement of one function to improve others closely similar to it, due to a subtle transfer of practice effect Improvement in them seems due to definite factors, the operation of which the training may or may not secure " The meaning of their results with respect to the formal training of abilities is made clear by the following statements " It is misleading to speak of sense discrimination, attention, memory, observation, accuracy, quickness, etc , as multitudinous separate individual functions [that] are referred to by any one of these words " There is no reason to believe that any general change occurs that may be called improvement in attention, sense discrimination and the like Increased attention, as a result of training, to the meaning of words does not guarantee increased attention to the spelling of words or to their length " The word *attention*, for example, can properly mean only the sum total of a lot of particular tendencies to attend to particular sorts of data, and ability to attend can properly mean only the sum total of all the particular abilities and inabilities, each of

which may have an efficiency largely irrespective of the efficiencies of the rest Improvement in any single mental function need not improve the ability in functions commonly called by the same name It may injure it"

The theory of identical elements In the Thorndike-Woodworth articles just cited there appears the following which may stand as an advanced statement of the theory of identical elements "The general consideration of the cases of retention or of loss of practice effect seems to make it likely that spread of practice occurs only where identical elements are concerned in the influencing and influenced function" That similarity, or identity of elements, as between the influenced and influencing functions, is an important condition in the probability that transfer will or will not occur, in measurable amounts, is not now debatable

The experiments of Thorndike and Woodworth, and the scores of others like them now available, show that improvement in a function does not extend in equal amounts to all other functions of its class Improvement by practice of 50 per cent in ability to discriminate weights is not attended by a like improvement in discriminatory judgments of lengths, brightness, statements of opinion, and all other functions requiring discrimination Were such the case we should all soon become intellectual giants The tedium and arduousness of the educative process should tell us that such is not the case, were we without any supporting experimental data On the other hand, we may judge that improvement in functions does carry over, does transfer, because otherwise mental development would not be possible at any cost nor education of any useful consequence capable of attainment So we may appropriately inquire to what extent and under what conditions learning transfers To these questions Thorndike addressed himself more explicitly in 1903, and in this connection he stated more fully the theory of identical elements "The answer which I shall try to defend is that *a change in one function alters any other only in so far as the two functions have as factors identical elements*" [5]

[5] E L Thorndike, *op cit*, p 80 (Italics mine)

The change, he says, in the second function is the necessary result of the "alteration of those of its factors which were elements of the first function and so were altered by its training" For example, alteration, to follow Thorndike, in addition will affect multiplication because the two processes have elements identical

Elaborating the theory in 1906 he recognizes two kinds of identity, that of *substance* and that of *procedure* By the former he means *content* and *skill* such as are acquired in mathematics and language, and *knowledge*, as in science and history, by the latter, such rigor as may come from exacting training in scientific method, like exactness in measurement, patience in examination of data, and impartiality in their interpretation [6]

Judd's investigations A second theory of transfer owes its origin to the pen of Charles H Judd, namely *generalized training* The theory was specifically advocated in 1908, although it was implicated in articles in 1902 and 1905 [7]

One of the most widely quoted of the early investigations is the Judd-Scholckow experiment in shooting at a target under water [8] Their subjects, fifth and sixth grade boys, practiced throwing small darts at a target placed 12 inches under water One group was given a theoretical explanation of refraction, the other was given no general knowledge The two groups progressed equally in all respects, the group that had the theoretical knowledge of refraction being in no wise the better When a certain proficiency had been reached, the position of the target was changed from 12 inches under water to 4 The subjects without the theory were confused, the skill formerly acquired did not transfer to the new situation, the errors were large and persistent Those with the theory adjusted quickly, their training transferred Results corroborative, in

[6] E L Thorndike, *The Principles of Teaching*, pp 243 ff New York A G Seiler, 1906

[7] C H Judd, "The Relation of Special Training to General Intelligence," *Educational Review*, 1908, Vol 36, pp 28–42 C H Judd, "Practice and Its Effects on the Perception of Illusions," *Psychological Review*, 1902, Vol 9, pp 27–39 C H Judd, "Practice without Knowledge of Results," *Psychological Monographs*, 1905, Vol 7, pp 185–198

[8] C H Judd, *op cit*, 1908

principle, of those set forth in Judd's articles were obtained by Ruediger, in which he found that neatness taught as an *ideal* in connection with one school subject transferred to others [9]

In exposition of this theory let us consider the matter of making comparative judgments as in matching shades of gray, lengths of lines, weights, and the intensity, pitch, and duration of sounds It is quite possible that improvement in one of these, secured through practice, will not extend to the others If, however, in connection with practice in one series, we give the subject some refined technique for making the judgments more precise, we should almost certainly expect the training to transfer to the others Ability to generalize and to do abstract thinking are the most exacting assessments we can make of the level of mental development of an individual or a society In academic training, moral education, or wherever we turn, instances are at hand To the extent that training is generalized, transfer will result

> It is no idle fancy of popular observation that the clergyman always adopts habits of behavior and thought appropriate to his walk in life Indeed, it has been charged that there are certain mental habits and ways of acting which go with the educational profession [10]

These are but general ways of saying that the mental resources acquired throughout a lifetime are useful to a man When confronted with a new situation a man's "habits do not retire to some convenient distances while some new and mysterious entities direct his behavior" — Thorndike

The general import of the results of Judd and Ruediger has been confirmed recently by Katona [11] Some of these are described presently in another context Hendrickson and

[9] W C Ruediger, "The Indirect Improvement of Mental Function through Ideals," *Educational Review*, 1908, Vol 36, pp 364–371 *Cf* C H Judd, *Psychology of Secondary Education* Boston Ginn and Co, 1927

[10] C H Judd, "The Relation of Special Training to General Intelligence," *loc cit*

[11] G Katona, *Organizing and Memorizing*, Chapters III and IV New York Columbia University Press, 1940

Schroeder, in an experiment quite similar in design to the Judd-Scholckow experiment, have produced confirmatory results [12]

The theories compared Two theories of transfer — two theories of how transfer takes place — have been introduced, *identical elements* and *generalized training* Both have been endorsed because both are logical developments from the experimental data upon which they are premised Are they different ways of saying the same thing? May one be reduced to the other? Are both logically necessary? Is one any more fundamental than the other? More useful in education? These are some of the questions that have been raised with respect to them

They do not say the same thing and probably the same thing was not intended These authors do not, psychologically speaking, think alike Thorndike was and is a faithful connectionist who has never deviated from his conception of learning as the formation of bonds On the other hand, Judd is not committed, systematically

The most practical and the most effective way of implementing the conditions of transfer in education is teaching designed to bring about the greatest amount of general understanding upon the part of pupils General knowledge is, *ipso facto,* knowledge that goes beyond the particular context in which the learning takes place It necessarily transfers, otherwise, it simply is not general

> Mental development consists in equipping the individual with the power to think abstractly and to form general ideas When the ends thus described are attained, transfer has taken place because it is the very nature of generalization and abstraction that they extend beyond the particular experiences in which they originate [13]

The question of whether or not transfer by generalization, understanding, and abstraction can be subsumed by identical elements is a matter on which the writer has no very definite opinion

[12] G Hendrickson and W H Schroeder, "Transfer of Training in Learning to Hit a Submerged Target," *Journal of Educational Psychology,* 1941, Vol 32, pp 205–213

[13] C H Judd, *Psychology of Secondary Education,* p 441 *Loc cit*

On the other hand, it seems pretty clear that the theory of identical elements cannot be reduced to the theory of generalized training, the former takes account of instances of transfer that are not envisaged by the latter The reader will recall that Thorndike recognized two kinds of identical elements, those of content and those of procedure Some writers have insisted that the two are not co-ordinate, but are contradictory As a *direct* effect of practice on Task *A* the subject acquires certain knowledge, skill, or other content which may be carried over to Task *B*, whose performance has in it some of the same elements This occurrence fits readily enough into the theory of identical elements, it is admitted But in the course of direct practice the learner may gain certain understanding as an *indirect* effect which he may apply successfully in attacking a subsequent task The latter, it has been alleged, is incompatible with the theory of identical elements [14] This is a question of epistemology, which we shall not here examine [15]

Finally, it should be appreciated that if transfer by generalized training, meaning, insight, and abstraction, are, in final analysis, subsumable under the theory of identical elements, which may well be the case, this form of transfer is not eliminated It is still just as practical and just as much to be striven for by our schools as if it stood as a basic, irreducible principle On the other hand, it is not assumed that the Judd-Katona data are necessarily contradictory to the theory of identical elements [16]

[14] P T Orata, *The Theory of Identical Elements, Being a Critique on Thorndike's Theory of Identical Elements and a Re-interpretation of the Problem of Transfer of Training* Columbus Ohio State University Press, 1928

[15] *Cf* W C Bagley, *The Educative Process* Chapter XIII New York The Macmillan Co, 1905 J A McGeoch, *The Psychology of Human Learning An Introduction,* Chapter X New York Longmans, Green and Co, 1942 P Sandiford, "Transfer of Training," *The School,* 1938, Vol 27, pp 93–97

[16] Other pioneering investigations J E Coover and F Angell, "General Practice Effect of Special Exercise," *American Journal of Psychology,* 1907, Vol 18, pp 328–340 J A Gilbert and G C Fracker, "The Effect of Practice in Reaction and Discrimination for Sound upon the Time of Reaction and Discrimination for Other Forms of Stimuli," *University of Iowa Studies Studies in Psychology,* 1897, Vol 1, pp 62–76

WITHIN-CLASS TRANSFER

In reality there are two orders, so to speak, of transfer One concerns transfer from samples of one class to samples of another class This order of transfer is investigated when, for example, the effect of practice in memorization of nonsense syllables upon memorization of poetry is determined, or the effect of practice in discriminating tones upon discrimination of brightness The majority of investigations in transfer relate to this aspect of the problem, and it is natural that they should do so because experimentation in transfer grew out of the doctrine of formal discipline – which predicated class-to-class transfer

Since successive samples of poetry or tones or shades of gray or syllables are not identical, it is legitimate to regard improvement accruing from practising successive samples within a class as a transfer effect This order has been called within-class transfer For example, if in the memorization of 10 successive samples of poetry, of equal length and difficulty, the last sample is memorized in less time than the first, it may be said that within-class transfer has occurred

One can by practice improve his performance in nearly all learned activities Literally hundreds of experiments have yielded volumes of incidental data on changes in facilitation in learning from sample to sample within a class In many kinds of experiments subjects are brought to a practice level as a preliminary condition to the main experiment – a procedure that recognizes within-class transfer Any experiment in which subjects memorize more than a single sample of a given class may contribute something to a knowledge of the effects of practice upon memorization Meumann writes that improvement of memory has no limit – "a given memory function may be developed to a maximum degree by practice" [17] Ebert and Meumann's subjects required from 19 to 34 repetitions to commit a list of 16 nonsense syllables at the beginning of training, and from 3 to 8 repetitions at the end With prose material,

[17] E Meumann, *The Psychology of Learning*, p 357 New York D Appleton-Century Co, 1913 (Translation by J W Baird)

from 17 to 38 repetitions were required at the outset, and from 5 to 14, at the end In repeating the Ebert-Meumann experiment, Reed found that his subjects, by 10 to 18 daily practices, reduced the time required to commit lists of nonsense syllables to about one-third of the original time [18] Incidentally the practice curves in such experiments show negative acceleration Improvement from the first to the second list is comparatively large

Theorists have usually had in mind class-to-class transfer But within-class transfer is also in need of explanation *Identity in procedure* — one of the kinds of identity specified by Thorndike — might be made to cover the phenomenon in a very general way Increased ability to pay attention, increased resistance to distractions and interferences, and a reduction in the number of activities that require *disruption* may be mentioned as instances The latter suggestion is in line with Guthrie's "all-or-none" or "one-trial" hypothesis of association forming — in support of which he calls attention to the large reduction in trials effected by Pavlov in his conditioning experiments by the use of a sound-proof, light-proof laboratory and by the removal of the experimenter from the room [19]

Gates and Taylor obtained a marked improvement in memory span (for digits) in a group of children practiced daily for 78 days The mean initial score was 4 3, the mean final score, 6 4 [20] The subjects were bright children, age 4 to 5 8 years After a lapse of 4 5 months with no practice the gain was largely lost This rapid deterioration plus the common knowledge that handwriting, typing and other skills brought to a high level may readily deteriorate, suggest that the schools are confronted with a special problem of maintenance Incidentally, this

[18] H B Reed, "A Repetition of Ebert and Meumann's Practice Experiment on Memory," *Journal of Experimental Psychology*, 1917, Vol 2, pp 315–346

[19] E R Guthrie, "Conditioning A Theory of Learning in Terms of Stimulus, Reponse, and Association," *The Psychology of Learning*, Forty-first Yearbook, Part II, Chapter I, National Society for the Study of Education Bloomington, Ill Public School Publishing Co , 1942

[20] A I Gates and G A Taylor, "An Experimental Study of the Nature of Improvement Resulting from Practice in a Mental Function," *Journal of Educational Psychology*, 1925, Vol 16, pp 583–592

problem may even extend to such matters as the maintenance of efficient study habits

As is well known to the students of education, rote memory long ago lost its position of dominance in our schools This is as it should be, but the fact remains that no inconsequential part of a pupil's learning is still of a rote character There is no logical way of deducing that the man credited with the discovery of America was christened Christopher or that his family name was Columbus, that he was born in Genoa in the year 1446 or that he planted the Spanish flag on American soil on October 12, 1492 There is no logical reason why there are 16½ feet in a rod or 5,280, in a mile So it is with much of the factual material learned in school Effective methods of securing such learning cannot safely be neglected Improvement of a function through practice — effective, effortful, directed practice — is one of the most general of all psychological phenomena All experiments in transfer presuppose improvement in the function practiced, that is, within-class transfer, otherwise there would be no point in the experiment Most learned functions can be improved by practice, but the improvement thus effected probably deteriorates unless maintained by suitable measures

Within-class transfer does not imply transfer from class to class The presence of transfer with respect to successive samples of the same class does not insure transfer from class to class Were the latter always obtainable, we would be justified in speaking of *memory training, training the will,* and so on, in the sense of general training Transfer from class to class may, of course, take place But since it does so only under certain prescribed conditions, as for example, when the two classes are similar, we are not warranted in speaking of training as being general, that is, of its extending to all classes of memory or perception or reasoning, and the like [21]

[21] *Cf* W F Dearborn, "The General Effects of Special Practice in Memory," *Psychological Bulletin,* 1909, Vol 6, p 44 W G Sleight, "Memory and Formal Training," *British Journal of Psychology,* 1911, Vol 4, pp 386–457

CONDITIONS OF POSITIVE AND NEGATIVE TRANSFER

Negative transfer effects are effects gone awry The possibility of negative transfer has been recognized from the start Thorndike and Woodworth, and Judd commented upon it in their articles published at the opening of the century, and in 1908 Angell discussed the question at some length [22] In 1914 Kline observed that training in cancellation of the letters *e* and *t* transferred negatively to the cancellation of words of certain parts of speech in a text [23] Martin found that training in cancelling words containing the letters *a* and *t* in Spanish prose reduced accuracy in cancelling words containing *e* and *s* [24]

In connection with his oft-cited article on transfer Poffenberger stated the following conditions of transfer

1 Where there are no identical bonds between stimulus and response in the two processes, the influence of one test upon another will be neither positive nor negative, *i e* , there will be neither transfer nor interference

2 Where there are identical elements in the two situations, or where a given process involves one or more bonds previously formed, there will be a positive or transfer effect

3 Where one test necessitates the breaking of previously formed bonds and the formation of new ones, there will be a negative effect or an interference [25]

Subsequent investigators have obtained results in accord with Poffenberger's formulations, notably Wylie, Hunter, Yum, and Bruce, although his own experimental results were far from decisive Bruce envisioned the problem as one of variable stimulus-response relationships Bonds are purely conceptual, and identity of bonds is an inference made after the fact, not some-

[22] J R Angell, "The Doctrine of Formal Discipline in the Light of the Principles of General Psychology," *Educational Review*, 1908, Vol 36, pp 1–14

[23] L W Kline, "Some Experimental Evidence in Regard to Formal Discipline," *Journal of Educational Psychology*, 1914, Vol 5, pp 259–266

[24] M A Martin, "The Transfer Effects of Practice in Cancellation Tests," *Archives of Psychology*, 1915, Vol 4, No 32

[25] A T Poffenberger, "The Influence of Improvement in One Simple Mental Process upon Other Related Processes," *Journal of Educational Psychology*, 1915, Vol 6, pp 459–474

thing describable beforehand Bruce has stated the conditions in investigatable terms as follows

1 Learning to make an old response to a new stimulus results in positive transfer

2 Learning to make a new response to an old stimulus results in negative transfer [26]

Earlier investigations by Wylie [27] and Hunter,[28] conducted in the field of animal psychology, had provided some ground for Bruce's formulations

Bruce caused the conditions of learning to make an old response to a new stimulus, and a new response to an old stimulus, to be met in varying arrangements of paired syllables, in which the first syllable of each pair was treated as a stimulus, and the last, as a response The following illustrates the procedure

Examples of original list	R E Q — K I V J O R — H E X Z U V — B U P
Examples of the arrangement for learning to make new responses to old stimuli	R E Q — Z A M J O R — L U P Z U V — X I D
Examples of the arrangement for learning to make old responses to new stimuli	V I L — K I V C E V — H E X D O Y — B U P

The condition in which the subjects (who had learned the original list) were required to learn new responses to old stimuli yielded slight negative transfer The opposite condition, wherein the subjects learned to make old responses to new stimuli, was productive of marked positive transfer This finding has been verified, as to its general import, by Langer [29]

[26] R W Bruce, "Conditions of Transfer of Training," *Journal of Experimental Psychology*, 1933, Vol 16, pp 343–361

[27] H H Wylie, "An Experimental Study of Transfer of Response in the White Rat," *Behavior Monographs*, 1919, Vol 3, No 5

[28] W S Hunter, "Habit Interference in the White Rat and in Human Subjects," *Journal of Comparative Psychology*, 1922, Vol 2, pp 29–59

[29] W C Langer, "An Investigation of the Positive Transfer Effects in the Learning of a Sensori-motor Task," *Journal of Psychology*, 1937, Vol 3, pp 371–379

The law of assimilation, or stimulus generalization The conditions of positive and negative transfer effects may be demonstrated in connection with certain phenomena of association The *law of assimilation* (when a stimulus-response relationship has been effected between *A* and *B*, other stimuli, A_1, A_2, etc , similar to *A*, will tend to evoke *B*) is an instance of positive transfer Lately, this phenomenon has appropriately been designated *generalization of stimulus* One of the first systematic investigations of the law of assimilation was made by Yum [80]

TABLE XLIX

EFFECT OF CHANGES IN THE MEANING OF STIMULUS WORDS UPON RECALL IN PAIRED-ASSOCIATES LEARNING

Condition	Mean	$P E_m$	Per Cent Recalled
Same Words	6 02	22	50 2
First degree similarity	3 91	22	32 6
Second degree similarity	1 35	16	11 3

In one experiment his subjects memorized lists of paired words as *snake — weather, fight — ledger, house — breeze* Under one condition a recall test was run (24 hours later) with the original first word of each pair being used in the capacity of stimuli Under another condition words quite similar in meaning were substituted for the original stimulus words (first degree similarity), as *serpent* for *snake, battle* for *fight* Under another condition words less similar were substituted (second degree similarity), as *turtle* for *snake, argument* for *fight* There were 12 such pairs to a list Table XLIX shows the results

In another experiment various visual patterns were paired with words Under various conditions of the experiment the patterns were so altered as to provide four degrees of similarity The results are shown in Table L Gulliksen [81] and McKin-

[80] K S Yum, "An Experimental Test of the Law of Assimilation," *Journal of Experimental Psychology*, 1931, Vol 14, pp 68–82

[81] H Gulliksen, "Transfer of Response in Human Subjects," *Journal of Experimental Psychology*, 1932, Vol 15, pp 496–516

ney [82] have published related research, and have corroborated Yum's findings The generality of the phenomenon in question has been further demonstrated by Hovland [83] and Gibson [84]

Gibson's subjects were allowed five trials on a list, referred to as the standard list, of geometric form-nonsense syllable

TABLE L

EFFECT OF CHANGES IN VISUAL PATTERNS UPON RECALL OF RESPONSE ASSOCIATES

Condition	Mean	$P E_m$	Per Cent Recalled
Same pattern	7 62	17	84 6
First degree similarity	5 81	23	64 5
Second degree similarity	4 42	21	49 1
Third degree similarity	4 08	22	45 3
Fourth degree similarity	3 27	22	36 3

pairs Subsequently, various groups of the subjects were given practice, five trials each, in learning other lists – lists made up of form-syllable pairs as before, in which there occurred in all lists the same response syllables, these being different from response syllables of the standard list For Condition I the stimulus forms were identical with those of the standard list In other conditions the forms were so altered as to provide varying degrees of similarity to the forms of the standard list It was found in one case that by empirical test these forms would elicit the originally learned (standard) responses in 41 1 per cent of the cases, the original eliciting the appropriate responses in 84 5 per cent of the cases Another list, resembling

[82] F McKinney, "Quantitative and Qualitative Essential Elements of Transfer," *Journal of Experimental Psychology*, 1933, Vol 16, pp 854–864

[83] C I Hovland, "The Generalization of Conditioned Responses I The Sensory Generalization of Conditioned Responses with Varying Frequencies of Tone," *Journal of General Psychology*, 1937, Vol 17, pp 125–148

[84] E J Gibson, "Retroactive Inhibition as a Function of Degree of Generalization between Tasks," *Journal of Experimental Psychology*, 1941, Vol 28, pp 93–115

the standard list only slightly elicited the standard response in only 9 7 per cent of the cases The fact that these altered forms tended to elicit the same responses as the standard list is an instance of positive transfer, and the fact that the probability of their doing so was a function of the degree of similarity maintained between the altered and standard lists gives further evidence of the generality of the phenomenon of similarity These findings, together with those of Yum and others previously cited are subsumed by the theory of generalized experience and also under the theory of identical elements

The law of associative inhibition In terms of the *Mueller-Schumann law of associative inhibition* (when an association has been formed between *A* and *B*, it becomes more difficult to form an association between *A* and any *C*, Chapter XI), Condition I, in Gibson's investigation, should prove to be the most difficult to learn because other responses had already been connected with the stimuli This is a case of learning to make a new response to an old stimulus, in Bruce's formulation The next most difficult should be the condition in which the stimulus forms have the greatest resemblance to the standard forms, and the least difficult should be the condition in which the forms bear no ostensible resemblance to the forms of the standard list Her results confirm this prediction in part Thus, there is a suggestion that the phenomenon of associative inhibition is an instance of negative transfer, and indeed may be an explanation thereof

The law of assimilation demands that when a stimulus response relationship has been effected between *A* and *B*, A_1, A_2, etc, similar to *A*, will tend to elicit *B* — an instance of positive transfer When this occurs, the law of associative inhibition demands that it will be more difficult to associate *A*, A_1, A_2, etc with some other response, *C*, other things being equal The latter is an instance of negative transfer

Gibson's findings really justify an extension of the law of associative inhibition which may be stated as follows When a stimulus, *A*, has been connected with a response, *B*, it becomes more difficult to connect *A*, and also other stimuli A_1, A_2, etc, similar to *A*, with another response, *C*, other things being equal

Generalization of response and cross-education From a systematic point of view the work on cross-education is important because of the light it sheds upon the mechanism of transfer The term *cross-education* seems to have been first used by Scripture, *et al*, in 1894,[35] in reference to the fact that practice of organs on one side of the body transfers to organs on the other side [36]

TABLE LI

EFFECT OF TARGET PRACTICE WITH RIGHT HAND UPON PERFORMANCE WITH RIGHT AND LEFT HAND

Subjects	Initial		Final		Gain	
	R	L	R	L	R	L
I	22	46	17	35	5	11
L	36	40	25	27	9	13
M	50	73	25	44	25	29
N	56	50	26	35	30	15
O	80	86	26	33	54	53
R	59	48	28	45	31	3

Scores in terms of error in mm

Davis practiced a group of subjects in tapping with the hand or foot and subsequently tested them for effects on other organs In one condition in which subjects were given practice with the right foot he found a resultant gain in performance with left foot and left hand practically as great as that obtained with the practiced member Similar evidence of generalization of response was obtained in other experimental arrangements,

[35] E W Scripture, T L Smith, and E M Brown, "On the Education of Muscular Control and Power," *Studies* Yale Psychological Laboratory, 1894, Vol 2, pp 114–119

[36] Both Fechner and Volkmann had reported the phenomenon as early as 1858 (W W Davis, "Researches in Cross-education," *Studies* Yale *Psychological Laboratory*, 1898, Vol 6, pp 6–50) For example, the latter found the two-point threshold of the left arm to be 23 6 mm , and of the right arm, 26 4 mm , before training After several weeks of training (in discriminating two closely spaced points as two rather than one) with the left arm alone, the limen of "twoness" on that organ stood at 11 2 mm , that on the corresponding area of the right arm, at 15 7

for example, in thrusting at targets Here, subjects practiced thrusting with the right hand, 10 thrusts a day for 10 days The effects on both right- and left-hand performances are shown in Table LI

Discrimination of visual patterns Some extremely interesting work on transfer of training from one retinal area to another has been done by Franz and his collaborators Franz and Layman gave practice in discriminating certain complex visual patterns presented peripherally, which at the outset could not be discriminated or identified with any considerable success [37] By means of special apparatus the patterns were so presented, tachistoscopically, that the images were projected upon the same retinal areas time after time In the course of 1000 or more tests on each subject, marked improvement in the function was secured, the right eye alone being stimulated It was then found that when the stimuli were presented to the corresponding area of the other eye "apprehension by the untrained left eye equalled or approached that by the trained right eye"

In a subsequent experiment Franz and Morgan found that the effects of training of one retinal — presumably one retinal-cortical area — transferred to other retinal areas of the trained eye The latter is the more crucial of the two experiments [38]

Data from neuro-physiology Closely related to the work just described is a large amount of experimentation in the neuro-physiology of animal learning, notably the research in brain extirpation by Lashley In one of his investigations hemiplegia (left side) was induced by destruction of the appropriate motor area of the cerebral cortex in a monkey Subsequently the animal was put to the learning of various latch-box problems, the right hand being employed When these tasks were consummated and some recovery made from the paralysis, the motor area in the other side of the brain was destroyed, with the result that the right hand was now weaker and less useful than the left Left-hand performance was

[37] S I Franz and J D Layman, "Peripheral Retinal Learning and Practice Transfer," *Publications of the University of California at Los Angeles in Education, Philosophy, and Psychology,* Vol 1, No 1, pp 65-78 Berkeley University of California Press, 1933

[38] S I Franz and R C Morgan, *op cit*, Vol 1, No 3, pp 91–98

quickly substituted for right-hand performance [39] It is as if the animal had learned a general *modus operandi* – a general thing to do, in order to reach the goal There need be no identity in movements by which the end result is brought about the only thing that is identical is that the same latch gets lifted or the same button gets turned This is, of course, not surprising because in learning a complex act or in performing it after it is learned, the successive trials are not, as a rule, identical An animal that has learned to run a maze correctly can swim along the true pathway if required to do so, as Macfarlane has shown [40] Lashley and McCarthy found that maze habits survived the destruction of the cerebellar hemispheres, so that afterward the animals literally stumbled through the correct pathway, making none of the movements exactly as they were made prior to the extirpation [41]

It seems in situations such as the foregoing the animal learns that a certain thing is to be done and that this learning acquired in connection with the exercise of one part of the body may transfer to performance with another part This is in line with much other work in cross-education, for example, the ball tossing experiments of Swift [42] and Munn,[43] those of thrusting at a target seen in a mirror by Bray,[44] and the tracing experiment of Cook [45]

[39] K S Lashley, "The Studies of Cerebral Function in Learning The Retention of Motor Habits after Destruction of the So-called Motor Areas in Primates," *Archives of Neurological Psychiatry*, 1924, Vol 12, pp 249–276

[40] D A Macfarlane, "The Role of Kinaesthesis in Maze Learning," *California University Publications in Psychology*, 1930, Vol 4, pp 277–305

[41] K S Lashley and D A McCarthy, "The Survival of the Maze Habit after Cerebellar Injuries," *Journal of Comparative Psychology*, 1926, Vol 6, pp 423–433

[42] E J Swift, "Studies in the Psychology and Physiology of Learning," *American Journal of Psychology*, 1903, Vol 14, pp 201–251

[43] N L Munn, "Bilateral Transfer of Learning," *Journal of Experimental Psychology*, 1932, Vol 15, pp 343–356

[44] E W Bray, 'Transfer of Learning," *Journal of Experimental Psychology*, 1928, Vol 11, pp 443–467

[45] T W Cook, "Studies in Cross Education," *Journal of Experimental Psychology*, 1933, Vol 16, pp 144–160, 679–700, 1934, Vol 17, pp 749–762

Bray's experiment Bray's investigation is of particular interest because of his analysis of the conditions of transfer made upon the basis of introspective reports of his subjects His subjects were engaged in thrusting at a target seen in a mirror, view of the target itself being obstructed by a screen As in other experiments in cross-education, the amount of response generalization was found to be significant The task presented two difficulties in particular (1) correction for the reversing effects of the mirror and (2) correction by the proper amount A majority of subjects reported they found it best to correct for the reversing effect by kinaesthesis

The location of the first thrust was pretty much a matter of chance The second "almost invariably carried the subject farther away from the target, because of the mirror-effect," and in the same direction The third frequently carried him still farther away Observing this circumstance many of the subjects learned to make corrections by reversing the direction of the movement as kinaesthetically experienced, disregarding visual cues except to get some appreciation of the amount of the error Other subjects hit upon the happy method of trying to go farther in the same direction as seen in the mirror This of course tended to bring them back toward the target

Concluding statement The experiments in cross-education have yielded results that are compatible with the general import of the theory of transfer by generalized experience, although this theory has never been formulated with sufficient exactness to permit any very certain statement about the matter They suggest a naive but useful generalization that subjects learn something about the task as performed with one member of the body which is valuable in reacting to it with another member However, it does not follow that the results are incompatible with the theory of identical elements merely because the word *generalized* is applicable to the results Indeed it is possible that because of the more precise formulations of the conditions of transfer, as associative inhibition, assimilation, stimulus generalization, and response generalization, the older theories, while substantiated, are also outmoded

FACTORS IN TRANSFER

Transfer as a function of nature of training Most of the discussions of transfer recognize that the presence or absence of measurable transfer and its direction, positive or negative, when present, are, among other things, functions of the relationships between the influenced and the influencing tasks But relationships between tasks are important only because they secure relationships between mental processes

Thus in the theory of identical elements, the identity meant is identity in mental function "One mental function or activity improves another in so far as and because they are in part identical with it" Similarly, the theory of generalized training presupposes generalization of mental function We shall in the following paragraphs describe some of the investigations in which attempts have been made to influence the nature of the mental activity by special training

Meredith investigated the effect of training in defining scientific terms in a laboratory course in science upon ability to define non-scientific terms [46] One group of boys participated in 15 short experiments in magnetism, no special practice being given in defining terms A second group was given some *practice* in defining terms, while a third group was given *practice* plus special *training*, in which the criteria of a good definition were presented The last-named group alone showed significant improvement in defining non-scientific terms

In a particularly instructive experiment Woodrow compared the effect of *practice* in memorization with that of practice and *training* His practice group devoted 177 minutes, distributed over eight periods, to the memorization of poetry and nonsense syllables "To the practice group this drill was given, as has been customary in experiments on transference, in a routine fashion without any explanation of principles, discussion of methods, or comparison of the methods to be used in different kinds of problems" [47] His training group received, in addition

[46] G P Meredith, "Consciousness of Method as a Means of Transfer of Training," *Forum of Education*, 1927, Vol 5, pp 37–45

[47] H Woodrow, "The Effect of Type of Training upon Transference," *Journal of Educational Psychology*, 1927, Vol 18, pp 159–172

to practice, instruction in the technique of memorizing Of the 177 minutes allotted to this group, 76 were devoted to an exposition of the technique of memorizing, 76 to memorization of poetry, and 25, to memorization of syllables Fore-tests and after-tests were given the practice and training groups as well as a control group in the following *rote poetry, rote prose,*

TABLE LII

GAINS, IN THE END TESTS, OF THE PRACTICE AND TRAINING GROUPS, AFTER SUBTRACTION OF GAINS OF THE CONTROL GROUP, AND GAINS OF THE TRAINING GROUP AFTER SUBTRACTION OF GAINS OF THE PRACTICE GROUP

End-Test	Practice Gain Minus Control		Training Gain Minus Control		Training Gain Minus Practice	
	Diff	*D/PE*	Diff	*D/PE*	Diff	*D/PE*
Poetry	+6	0 3	+115	6 1	+109	4 7
Prose	−16	0 8	+187	7 5	+203	7 3
Facts	+0 3	0 2	+11 5	7 2	+11 2	5 3
Dates	+0 5	1 3	+3 5	8 8	+3 0	6 0
Vocab	+0 6	1 0	+7 6	10 9	+7 0	8 8
Span	−0 8	8 0	+0 9	9 0	+1 7	17 0

prose substance, Turkish-English vocabulary, historical dates, and *memory span* (The subjects were college sophomores) Different selections were used in the two tests

The comparative effectiveness of the two methods is indicated in part in Table LII The differences between the practice and control groups are small and in all but one instance unreliable All of the differences between the training and control group and between the training and practice groups exceed the conventional criterion of statistical reliability, *i e*, differences four times the *P E*'s of the differences

The same distinction between practice and training has been observed also by Cox in his article dealing with the acquisition of skill in assembling and wiring electric lamp holders [48] In

[48] J W Cox, ' Some Experiments on Formal Training in the Acquisition of Skill,' *British Journal of Psychology*, 1933, Vol 24, pp 67–87

addressing himself to the problem "how far does the training of a one mental function improve other mental functions," he suggests that the answer may depend upon "the way in which the mental function has been trained" He also points out that transference may show itself in two ways (1) upon *ability*, in which the effects of training in one function will produce an immediate effect upon performance in some other function, and (2) upon *improvability*, in which the effects upon a subsequent activity are not immediately present but will appear in the form of facilitated progress as the subsequent activity is practiced

TABLE LIII

MEAN GAIN OF TRAINEES AND THAT OF INITIALLY EQUAL CONTROLS, WITH STANDARD ERROR OF DIFFERENCE (SECONDS)

Test	Trainees	Controls	Difference	Standard Error
Assembling screws	36 9	11 0	+25 9	7 11
Stripping screws	33 8	8 7	+25 1	3 75
Porcelains	163 0	63 3	+99 7	27 96
Wedges	20 6	4 7	+15 9	6 12
Wiring	161 6	56 3	+105 9	32 4

Practice was first given in one each of the operations, and appropriate tests were made to determine the effect of such practice upon *ability* and *improvability* in various other operations It was found that in comparison with a control group all the subgroups were markedly superior in the *operation in which they had practiced*, but were not reliably superior in any of the unpracticed operations

A *training* experiment was subsequently carried out along the same general lines as the *practice* experiment, except that in addition to providing specific practice in one of the operations an effort was made to "impart knowledge of certain general principles underlying the skillful handling of assembly material", and application of the principles was made to this

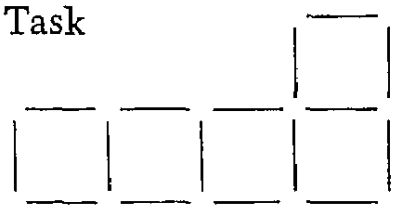
operation and to it alone The time required for general instruction was not added to the total practice time, but was subtracted from it, so that the practicing and training group devoted an equal amount of time to the experiment

At the end of the training period the initial battery of tests was readministered to the control group and to the trainees The results are shown in Table LIII

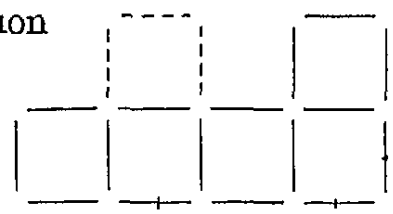
As a means of ascertaining the effect of the training program upon *improvability* the subjects thus trained were given practice exercises in the operations involved in the other tests The training provided operated to accelerate progress through subsequent practice Thus, training transferred to what Cox called *ability* and *improvability*

Final reference is made to one of the investigations of Katona, in which he compares, with respect to transfer, a "senseless" and "meaningful" method of teaching "match tasks" [49] Under one condition subjects were shown how to reduce the following five squares to four by changing the position of three and only three sides The arrangement at the right was demonstrated as a teaching device Six demonstrations were pro-

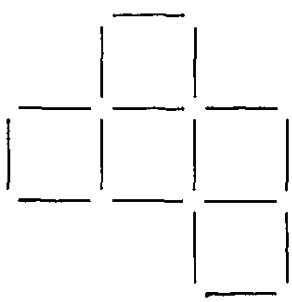
Task



Demonstration



vided in order to assure mastery The subjects who by this instruction mastered the task were subsequently unable to solve the following, within the specified time limit When



[49] *Op cit*, pp 55–64 Figures reproduced by courtesy of the publishers

instruction was given in the first task by the stating of some adequate principle, transfer to the second task did occur One such means was, in part, as follows Since there are 16 lines from which are to be constructed four squares, "each square must have four independent sides lines"

The foregoing experiments give point to the assertion that transfer is a function of the nature of the *mental activity* secured in the influencing task The nature of the *task* is a determining factor because the nature of the activity induced is among other things a function of the task They show that the nature of the activity induced can be influenced also by appropriate instruction or training [50]

Transfer as a function of the brightness of the learner As Ryans suggests, the application of previous learning to an immediate problem is our best evidence of intelligence [51] Our classical definitions of intelligence imply this, a widely quoted one of which is *the ability to adapt to new situations* One can make a successful adaptation to a new situation only in terms of previous learning, otherwise his reactions would be infantile Intelligent reactions cannot be made to *entirely new* situations, they must bear some similarity to situations previously encountered Our definitions of intelligence and of transfer being what they are, there is *a priori* a necessary association between brightness and transfer

In his well-known investigations on *mental discipline in high school studies* Thorndike sought to assess the effect of a year's

[50] *Cf* M C Barlow, "Transfer of Training in Reasoning," *Journal of Educational Psychology*, 1937, Vol 28, pp 122–128 E E Bayles, "An Unemphasized Factor in Current Theories Regarding the Transfer of Training," *Journal of Educational Psychology*, 1936, Vol 27, pp 425–430 K E Ludgate, "The Effect of Manual Guidance upon Maze Learning," *Psychological Monographs*, 1923, Vol 33, Whole No 148 R H Waters, "The Influence of Tuition upon Ideational Learning," *Journal of General Psychology*, 1928, Vol 1, pp 534–549 G M Whipple, "The Transfer of Training," *Nature and Nurture Their Influence upon Achievement*, Twenty-seventh Yearbook, Part II, Chapter XIII, National Society for the Study of Education Bloomington, Ill Public School Publishing Co, 1928

[51] D G Ryans, "An Experimental Study of the Transfer of Training with Special Attention to the Relation of Intelligence Test Performance," *Journal of Educational Psychology*, 1936, Vol 27, pp 492–500

schooling in English, history, geometry, Latin, biology, bookkeeping, home economics, and various other high school subjects upon performance on the I E R Test of Selective and Rational Thinking and the I E R Test of Generalization and Organization [52] After making deductions for practice effects, he found that the best one per cent in initial ability made an average gain of 20 5 points, the lowest one per cent, an average gain of 1 5 points "Those who have the most to begin with gain the most during the year Whatever studies they take will seem to produce large gains in intellect"

An investigation by Brooks provides partial substantiation to Thorndike's results Low positive correlations of the magnitude of from 24 to 32 were obtained between test intelligence and amount of transfer from training in mental multiplication to mental division Other test situations, such as immediate memory, addition, subtraction, cancellation, and French vocabulary, failed to yield significant correlations However, for the most part they did not give significant evidence of transfer in the first place [53]

Rugg obtained evidence of a positive relationship between transfer effects in descriptive geometry and scholarship in mathematics [54] In an analysis of errors made in spelling relatively novel words, Grades 4 to 6, Carroll found that the preponderance of the errors made by bright pupils involved a single letter and were phonetically logical, giving evidence of logical but negative transfer to the spelling of the word at hand The misspellings of the dull students did not to the same degree show this logical character [55]

Pratt analyzed the performances of 1229 college freshmen on

[52] E L Thorndike, "Mental Discipline in High School Studies," *Journal of Educational Psychology*, 1924, Vol 15, pp 1–22, 83–98

[53] F D Brooks, "The Transfer of Training in Relation to Intelligence," *Journal of Educational Psychology*, 1924, Vol 15, pp 413–422

[54] H O Rugg, "The Experimental Determination of Mental Discipline in School Studies," *Educational Psychology Monographs*, 1916, No 17

[55] H A Carroll, "Generalization of Bright and Dull Children, a Comparative Study with Special Reference to Spelling," *Journal of Educational Psychology*, 1930, Vol 21, pp 489–499

the arithmetic section of the Psychological Examination A C E (American Council of Education) with the view of determining which students had made use of algebra in attacking the problems [56] The mean total A C E score of those who had made use of algebra was 149, that of those who had not, 116 [57]

Transfer and amount of training (1) *Positive transfer* Several investigations have yielded results that give evidence that both the amount and sign of transfer are influenced by amount of training Bruce found that the amount of positive transfer increased directly with the number of practices [58] Hovland,[59] in his investigation of generalization of conditioned galvanic responses, found that the extent of the generalized responses increased as the number of reinforced stimulations increased, a finding that Razran [60] has confirmed In a series of maze experiments Ho, using animals as subjects, obtained a positive relationship between the degree of integration of a habit and the magnitude of transfer effects [61]

(2) *Negative transfer* Several investigators have found, in the case of activities that yield negative transfer, a tendency for the sign to change to positive with continued practice of the inducing activity Kline, who investigated a number of conditions, reported that those activities which yielded negative transfer did so only when a small amount of practice was

[56] K C Pratt, "Intelligence as a Determinant of the 'Functional' Value of Curricular Content," *Journal of Educational Psychology*, 1938, Vol 29, pp 44–49

[57] *Cf* J R Overman, "An Experimental Study of Certain Factors Aecting Transfer of Training in Arithmetic," *Educational Psychology Monographs*, 1931, No 29, pp 235 H Woodrow, "Practice and Transference in Normal and Feeble-minded Children," *Journal of Educational Psychology*, 1917, Vol 8, pp 85–96, 151–165

[58] *Op cit*

[59] C I Hovland, "The Generalization of Conditioned Responses IV The Effects of Varying Amounts of Reinforcement upon the Degree of Generalization of Conditioned Responses," *Journal of Experimental Psychology*, 1937, Vol 21, pp 261–276

[60] G H S Razran, "Studies in Configurational Conditioning V Generalization and Transposition," *Journal of Genetic Psychology*, 1940, Vol 56, pp 3–11

[61] Y H Ho, "Transfer and Degree of Integration," *Journal of Comparative Psychology*, 1928, Vol 8, pp 87–99

levied [62] Corroborative results have been obtained by Bruce [63] and by Siipola and Israel [64]

The operation of a related phenomenon is seen in the fact that continued practice of two antagonistic acts tends to reduce the interference to zero This may be observed in many activities of daily life, as for example, in the case of persons who have acquired fluency in two or more languages Stroop, for one, has subjected the phenomenon to experimental investigation [65]

TRANSFER AND LEARNING IN SCHOOL

The curriculum The fact of transfer is not debatable, it stands as the principal explanation of how education functions in the stress of daily life, and indeed of how it is possible for an individual to acquire an education If the effects of any item of schooling do not transfer — either to other items of schooling or to life situations — such an item is valueless The absence of transfer in profitable amounts from pursuance of a course of study does not invalidate transfer but rather that course of study Courses of study having the greatest transfer value — and, therefore, the greatest value — are those that have the greatest pertinence to the problems of daily life and to the understanding of nature and the cultural history of man [66]

Certain modern educational theorists have given the impression that they have eschewed transfer of training as a guiding principle in education This probably is not exactly what is meant A glance at their positive recommendations shows that what they are actually striving for is some more dependable method of effectuating it Surely no one could actually provide an educational program that would in miniature give an exact

[62] L W Kline, "An Experimental Study of Associative Inhibition," *Journal of Experimental Psychology,* 1921, Vol 4, pp 270–299

[63] *Op cit*

[64] E M Siipola and H E Israel, "Habit-interference as Dependent upon Stage of Training," *American Journal of Psychology,* 1933, Vol 45, pp 205–227

[65] J R Stroop, "Studies of Interference in Serial Verbal Reactions," *Journal of Experimental Psychology,* 1935, Vol 18, pp 643–662

[66] *Cf* R O Billett, *Fundamentals of Secondary-school Teaching,* Chapter VII New York Houghton Mifflin Co, 1940

preview of all that is to come in life after school This could not be done even with the guarantee that the pattern of adult life would never change That which stands to the credit of these theorists is the fact that they have striven to effect the greatest possible similarity between school and afterlife To the extent that they have succeeded, they have provided for one of the well-known conditions for the successful operation of transfer, not for something to take the place of transfer It cannot be gainsaid that transfer is, has been, and will be the chief instrumentality in securing an education and in applying it when secured The goal in curriculum making should be the securing of more transfer, not less

A second trend in modern education, the increasing emphasis upon meaning, understanding, useful generalization, etc, has its chief justification, in so far as functional value goes, in the fact that it furthers transfer Generalizations about pertinent aspects of man and the universe are useful and applicable because of their transfer value A method of instruction that utilizes facts as means to an end — a means of attaining generalizations — is to be defended on the same ground

The theory of generalized experience, as well as the theory of identical elements, gives us justification for making school lifelike Lifelikeness insures transfer not only because of the similarity between life and school thus secured, but also because this same lifelikeness in instruction, for reasons stated in the ensuing chapter, means greater understanding of instruction

Pupil participation The foregoing is illustrated in the pupil-participation movement Many educators have seen in pupil participation in school management excellent opportunities for training in citizenship In 1909 Dewey averred "the school cannot be a preparation for social life excepting that as it reproduces, within itself, typical conditions of social life" [67]

To the same purpose, in 1931, Fretwell wrote. "These pupils can be learning in the voluntary associations with their fellows how to cooperate for a common good, how to lead or select a

[67] J Dewey, *Moral Principles in Education*, p 14 Boston Houghton Mifflin Co, 1909

leader wisely and to follow him, how to assume responsibility and to make good, and, where the teachers advise enough but not too much, there is a real opportunity for the development of many of the qualities a good citizen must have" [68]

Since the problems of citizenship in school cannot be identical with those encountered in later life, the value of pupil participation must depend to an extent upon transfer of training Transfer may be made more certain by inculcating *general* democratic ideals and principles of self government, and by effecting as much similarity as possible between the social organization in school and social organization in the community

Spelling Some of the most interesting work in the whole field of transfer has been done in connection with spelling, an area that offers many possibilities for both positive and negative transfer The operation of transfer is indicated if previous training facilitates the learning of new words and if a pupil who has learned to spell can get some of the right letters, or letters that have the right sound, in a new word Anyone who has given a little casual assistance in spelling to a child as he progresses from the first to fourth grade must be convinced that both of these conditions prevail In the intermediate grades, pupils show considerable ability in spelling untaught words Sifert obtained a coefficient of 94 between ability to spell taught and untaught words [69] Of course phonetic transfer is only one of the factors in this situation, another being the fact that some of the words, perhaps many of them, had been encountered before in reading

The fact that in English spelling, letters have many different sounds and that the same sounds may be represented by many different letters occasions many instances of negative transfer and makes reliance upon transfer in the teaching of spelling unwise For example the sound of the letter *a* may be represented by ā-a as in paper, a-e as in ate, ai as in fail, ai-e as in

[68] E K Fretwell, *Extra-curricular Activities in Secondary Schools,* pp 111–112 Boston Houghton Mifflin Co , 1931

[69] E R Sifert, "A Comparative Study of the Abilities of Eighth Grade Children to Spell Studied and Unstudied Words," *Master's Thesis* State University of Iowa, 1926

praise, ay as in play, ea as in great, ĕ-a as in May, ai as in said, ay as in says, ea as in bread, â-a as in parent, a-e as in hare, ai as in air, ay as in prayer, ea as in wear, ô-a in warm, and so on [70]

Horn described a circus to groups of first grade pupils who had had training in phonetics and asked them to write the word that stood for the thing described Some of the spellings, together with their frequencies, are as follows *srcus*, 20, *siks*, 10, *circus*, 6 He states that the sound *ẽr* in circus can be spelled accurately or approximately in the following ways as *ir* in first, *or* in word, *ur* in fur, *our* in journey, *ear* in search, *ere* in were, *ure* in measure, *err* in err, *oar* in cupboard, *oir* in avoirdupois, *eur* in chauffeur, *olo* in colonel, *ro* in iron, *re* in acre, *yr* in myrtle, *yrrh* in myrrh, *irr* in firry, *urr* in hurry, *orr* in worry, and *ar* in parental [71]

(1) *Derivatives* Archer obtained evidence of marked transfer, positive and negative, in adding prefixes and suffixes after the base words had been studied and in spelling the base words when derivatives alone had been studied [72] The *s* and *ed* forms gave the most consistent positive transfer No difficulty was experienced with *tion*, except where the phonetic quality changed to add the suffix, as between decide and decision The most common instances of negative transfer were those which occurred in the spelling of words wherein the final *e* is dropped before adding *ing*, and in the spelling of certain base words like *excel* when the derivatives *excelled* and *excelling* had been studied [73]

(2) *The teaching of rules.* Another problem that has emerged in connection with transfer in spelling is the value of

[70] E Horn, "The Child's Early Experience with the Letter *a*," *Journal of Educational Psychology*, 1929, Vol 20, pp 161–168

[71] E Horn, "The Influence of Past Experiences upon Spelling," *Journal of Educational Research*, 1929, Vol 19, pp 283–288

[72] C P Archer, "Transfer of Training in Spelling," *University of Iowa Studies Studies in Education*, 1930, Vol 5, No 5

[73] *Cf* I C Sartorius, "Generalization in Spelling, a Study of Various Bases of Generalization in Teaching Spelling," *Teachers College, Columbia University, Contributions to Education*, No 472, 1931 J E Mendenhall, *An Analysis of Spelling Errors, a Study of Factors Associated with Word Difficulty* New York Bureau of Publications, Columbia University, 1930

rule *invert the divisor and multiply* for dividing fractions is perfectly general We do not ask "What fraction?" If a pupil is asked to find six per cent of a number it does not matter whether the number designates a quantity of bacteria in milk or size of the local police force

There has existed for some time a movement to make arithmetic lifelike This is all to the good, but it is desirable to know why It is, of course, to make arithmetic more useful and more interesting It is more useful not so much because of the similarity effected between the problems of the school and of life, for generalized skills transfer nearly 100 per cent, but because lifelike instruction is more meaningful In being more meaningful it will be more interesting In lifelike situations we can make the learning of arithmetic a means to a natural end It ceases to be a chore It is for this reason that lifelike teaching is superior, from the standpoint of motivation, to the traditional, abstract, formal teaching of arithmetic

The fact of transfer in arithmetic skills is not an educational problem However, certain special problems have arisen, namely that of the necessity of teaching all addition and subtraction facts and the value of teaching various generalization procedures

(1) *What combinations to teach* A question raised some 30 years ago is whether or not a pupil who has learned $8 + 5$, $10 + 3$, $4 + 0$, can do $5 + 8$, $20 + 3$, $8 + 0$, and so on The data at hand suggest an affirmative answer It is not essential to teach all possible arithmetic facts, transfer can take care of many of them Perhaps students who for a length of time study 50 of the addition facts and 50 of the subtraction facts may do almost as well as students who devote a similar length of time in the aggregate studying all of the addition and subtraction facts Investigations by Brito and Brueckner [79] and Olander [80] show this

[79] E A Brito and L J Brueckner, "A Measurement of Transfer in the Learning of Number Combination," *Research in Arithmetic,* Twenty-ninth Yearbook, Part II, pp 569–587, National Society for the Study of Education Bloomington, Ill Public School Publishing Co , 1930

[80] H T Olander, "Transfer of Learning in Simple Addition and Subtraction," *Elementary School Journal,* 1931, Vol 31, pp 358–369

To the same purpose is the investigation of Knight and Setzafandt [81] They engaged a group of pupils, just ready to learn fractions, in adding lists in which 18 numbers ranging from 2 to 30 were used as denominators Another group was given the same amount of practice, in the aggregate, on but 10 of the 18 numbers, no practice being given on the other eight Subsequently, the latter group proved to be about as proficient in adding fractions containing these eight integers as denominators as the former group In this narrow skill, training transferred nearly 100 per cent It may be assumed that the pupils had acquired a generalized method by which the simple addition facts previously learned could be applied to the new problem of adding fractions [82]

Such findings are chiefly of psychological interest There is no indicated educational economy An investigation of economy would require that the amount of practice per combination be held constant Logically, there is no good reason why there should be any economy in not teaching all of the combinations Ten repetitions of 8 + 5 and 10 of 5 + 8 should be just as effective as 20 of either alone In view of present day testing-teaching procedures the problem is not very vital Pupils receive not indiscriminate drill, but drill on the combinations which tests show them to need

(2) *Generalization and meaning* Perfection several years ago of some excellent computational tests and drill exercises led to great emphasis upon drill work in arithmetic — too much emphasis, aver some authorities The critics insist that more attention be given to the origin and meaning of number concepts, to understanding and discovery, at the expense, if need be, of consummate skill (see Chapter VI) Presumably the chief object in teaching arithmetic is to prepare the pupil to do quantitative thinking, solve problems by the aid of arithmetical manipulations, now and afterward This school of thought proceeds upon the assumption that, inasmuch as arithmetic

[81] F B Knight and A O H Setzafandt, "Transfer within a Narrow Mental Function," *Elementary School Journal*, 1923–24, Vol 24, pp 780–787

[82] *Cf* D Starch, "Transfer of Training in Arithmetical Operations," *Journal of Educational Psychology*, 1911, Vol 2, pp 306–310

is a generalized skill, this end will be best served by greater emphasis upon meaning In 1925 Hamilton [83] wrote "That form of psychology, so much favored by workers in this field, which describes everything in terms of bonds between stimuli and responses is quite incapable of giving an adequate description of pure calculation, to say nothing of its inability to describe how we solve problems, for in that psychology there is no difference between insightful procedure and purely habitive procedure" [84]

The value of "discovery" as opposed to "authoritative identification" in arithmetic has invited some experimental effort [85] In a recent volume Judd has the following to say "the most effective use of knowledge is assured not through the acquisition of any particular item of experience but only through the establishment of associations which illuminate and expand an item of experience so that it has general value" [86] The assumptions made by the advocates of meaning-insight-understanding are (1) that the best way to attain the objective stated by Judd is through purposeful instruction directed thereto, (2) that when attained the processes will be more effectively retained than when taught as specific, discrete responses, and (3) that the attainment of these goals promotes generalization and therefore transfer to the problems of life These assumptions appear to be sound psychologically

The case for "discovery" is difficult to evaluate, and indeed, cannot be evaluated until the term is given precise definition There is discovery with help, much or little, and discovery without help In a sense any act of understanding is a discovery no matter by how much help or explanation the understanding

[83] E R Hamilton, "Insight and Skill in Arithmetic," *Journal of Educational Research,* 1925, Vol 12, pp 136–144

[84] In all probability connectionists recognize the presence and efficacy of insight, intelligence, understanding, and similar qualities by whatever name they pass, although they often write as if they did not (*cf* Chapter XI)

[85] T R McConnell, "Discovery Versus Authoritative Identification in the Learning of Children," *University of Iowa Studies Studies in Education,* 1934, Vol 9, No 5

[86] C H Judd, *Educational Psychology,* pp 499–500 Boston Houghton Mifflin Co, 1939

is achieved It may well be that the really important thing in arithmetic is the securing of understanding There appear to be some psychological advantages in discovery without assistance, although it is easy to overemphasize it We do not really know at present just how important discovery in this sense is If and when such knowledge is at hand, the teacher will have to effect some kind of favorable balance between the psychological advantages on the one hand and economy of time on the other

Foreign languages We find delineated in foreign languages most of the principles of transfer as discussed in this chapter There is so much in common at least among the languages of the Aryan family that transfer in numerous ways is inevitable This does not mean of course that the average high school or college student should be asked to study a foreign language for the transfer effects upon his own language. This for all practical purposes amounts to learning a difficult task in order to gain mastery over a comparatively easy one From the standpoint of practical usage, the average student could more profitably devote the time spent on a foreign language to the study of his own language But there is such a thing as scholarship in language, toward the attainment of which some virtuous study of one or more foreign languages may be regarded as highly desirable, if not indispensable

In the interest of promoting transfer value of languages two or three suggestions are offered The first and most important is that attention be centered on the science of language Courses in general language, advocated by certain theorists, meet these conditions to a degree, and for most students are sufficient The serious student of language will require in addition considerable mastery of one or more foreign languages Certainly it would be difficult to show that the translation method of studying a foreign language — especially a difficult one like Latin — is of any material help in mastering English composition or grammar, unless there accompanies the translation method a thoroughgoing study of the science of language

The transfer value of training in a foreign language naturally depends upon the nature of training It has been shown, for

example, that the extent of the effect of studying Latin upon English vocabulary is a function of the method of instruction [87] Something of the same may be said of the effect of the study of Latin upon English spelling, where both positive and negative transfer effects have been observed [88]

As is well known, Latin is no longer regarded as a part of the necessary equipment of an educated person Most educated persons today are largely ignorant of the subject For the most part Latin has been supplanted in secondary and collegiate curricula, not because it lacks transfer value, but because other subjects have more Those subjects have the greatest cultural value which have the greatest pertinence to the problems of the age and time and culture in which one lives In our own time, history, economics, sociology, psychology, geography, and the various branches of science, and other related fields of knowledge, have in large measure crowded out the classical languages It will be noted that during the reign of classical languages most of these subjects either did not exist as separate items of the curriculum or were only in their infancy

On training the mind Classical scholars have maintained that virtuous study of the classical languages develops the mind Like the professors of education who have taken issue with them these scholars were eminently right and definitely wrong That the study of classical languages may train and develop the human mind is, in the author's opinion, beyond cavil That it does not do so by the pattern of formal discipline seems equally unassailable It contributes to the knowledge of language – which enhances culture and skill in thought and communication It contributes to knowledge of the life and thought of two great civilizations of the ages To say such knowledge does not contribute to the development of the mind

[87] E L Thorndike and G J Ruger, "The Effect of First Year Latin upon Knowledge of English Words of Latin Derivation," *School and Society*, 1923, Vol 18, pp 260–270, 417–418 G R Miller and T H Briggs, "The Effect of Latin Translations on English," *School Review*, 1923, Vol 31, pp 756–762

[88] W W Coxe, "The Influence of Latin on the Spelling of English Words," *Journal of Educational Research*, 1924, Vol 9, pp 223–233 *Cf* same journal 1923, Vol 7, pp 244–247

is to say that education does not do so Certainly a study of the classics should contribute to our ability to think, but it does so by adding to our "appreceptive masses" and by giving us better tools of thought, not by the nurturing of some hypothetical faculty of thinking All of which should not prejudice us against the possibility that there are other subjects of greater worth in the development of the mind

Training involving transfer There is a fairly large literature of a miscellaneous character that belongs under the general schema of transfer Since the articles for the most part represent isolated pieces of research, it is impossible to make any sort of validation by checking one against the other Two of these are briefly described here Salisbury sought to determine the effect of "carefully prepared lessons" in outlining and summarizing upon ability to solve rational problems and upon performance in achievement tests, for groups of pupils in Grades 7, 9, and 12 [89] Outlining was pointed not so much toward better composition as toward thought patterns and organization It featured discrimination and comprehension of the relationships among ideas (independence, dependence, and equality), familiarity with the simple types of organization (logical, chronological, and arbitrary) and devices that show progression from one idea to another Significant gains, presumably as a consequence of this training, were observed in reading comprehension, and in achievement test scores in history and civics

To the same purpose is White's investigation of the effect of training in logic upon the "habits of thought in school children," mean age, 12 years, 11 months [90] Training was given in connection with a course in grammar in (1) classification, (2) inference, an (3) emotional or affective thinking – prejudice and its relation to the origin of beliefs Positive and statistically significant transfer effects were obtained with respect

[89] R Salisbury, "A Study of the Transfer Effects of Training in Logical Organization," *Journal of Educational Research*, 1934, Vol 28, pp 241–254 R Salisbury, "Some Effects of Training in Outlining," *English Journal*, 1935, Vol 24, pp 111–116

[90] E E White, "A Study of the Possibility of Improving Habits of Thought in School Children by a Training in Logic," *British Journal of Educational Psychology*, 1936, Vol 6, pp 267–273

to scores on a reasoning test, and on English construction Positive but not fully reliable effects were observed on written composition [91]

TRANSFER THROUGH MENTAL ORGANIZATION

As has already been stated, transfer is an essential condition in mental growth and development Some of the reasons why this is so have also been indicated There remains to be noted a further aspect of the greatest consequence in the furtherance of mental development through transfer, namely the organization of experiences No quantity of experiences could ever make an integrated individual – a personality having various predispositions and reaction patterns except as experiences become organized around certain articulating cores, so to speak We all know what it means to have ideals, principles, a philosophy of life, frames of reference, attitudes, behavioral dispositions, standards of social conduct, prejudices, beliefs, and so on In a sense these are organizations of past experiences into certain personality patterns We are also aware of the importance of these patterns in daily conduct As often as any issue of consequence to us arises it is met with one or more species of our personal armor The effects of past experience transfer to the situation They determine what our initial attitude shall be, what method of attack shall be followed, how we shall weigh the evidence, and influence our conduct in a host of other ways Thus, while transfer has usually been treated, in education and psychology, as a condition of learning, it is no less a condition in the adaptive behavior of the individual

The foregoing leads to consideration of what the factors are that lead thus to the organization of experiences into functional systems, as it were Without attempting an exhaustive answer, and without considering the possibility of there being other factors, we shall suggest that a dominant factor is the motives of the individual The subject of the ensuing chapter is motivation Questions pertaining to source, kind, nature,

[91] *Cf* M C Barlow, *op cit* E P Jalmson, "Teaching Pupils the Conscious Use of a Technique of Thinking," *Mathematics Teacher*, 1924, Vol 17, pp 191–201

development, and functions of motives are discussed there Suffice it to say for the present that the abiding motives — purposes, interests, and the like — serve to integrate experiences into functional patterns Such integration becomes an all-important item in mental development, and at the same time provides a medium through which the effects of past experience are applied to a situation

CHAPTER XVI

CONDITIONS OF MOTIVATION

The terms *motive* and *motivation* are best understood by the various figurative meanings of the Latin *movere* from which they are derived to move, to stir, to excite to action, to arouse feeling, to purpose, to take action In psychological parlance a motive is a form of persistent stimulation that dominates the behavior of the organism until its conditions are satisfied Thus a motive is a condition of disequilibrium Every reaction of the organism is instigated by disequilibrium in tissues, and successful reactions, by definition, restore a condition of equilibrium Perspiring and shivering are prompted by a disturbance in the temperature balance of the body and these aroused actions tend to restore the balance Breathing likewise is stimulated by a condition of local disturbance which the intake of oxygen temporarily alleviates The knee jerk caused by an appropriate blow to the patellar tendon has as a partial cause a condition of disequilibrium set up by the blow

By custom we do not speak of reflexive behavior as being *motivated* For methodological reasons psychologists have reserved the term *motive* for more complex kinds of behavior The distinction between motivated and non-motivated behavior, while never a hard and fast one, is made on several grounds Conditions of disturbance the responses to which are *highly localized* are excluded from the category of motivation Another basis of distinction is a temporal one the term motive is reserved for the more *persistent type* of disturbance Carr's definition is a case in point "A motive is a relatively persistent stimulus that dominates the behavior of an individual until he reacts in such a manner that he is no longer affected by it"[1] To the same purpose is Guthrie's definition "By a *motive* we

[1] H A Carr, *Psychology*, p 73 New York Longmans, Green and Co, 1925

shall mean persistent stimuli or organic conditions which create and maintain excitement" [2]

Another limiting characteristic of motives, and one that describes their function, is that they represent a kind of stimulation that affects an organism's reaction to other sources of stimulation Reactions to food stimuli are influenced by hunger stimulation, pain is a motive and as such influences one's reaction to a thorn in his flesh, sympathy is a motive that may influence one's reaction to a thorn in another's flesh There are, of course, many conditions that influence reactions to stimuli that are not encompassed in the concept of motivation for example, muscle tensions, summation and facilitation in nerve conduction, drugs, and intelligence These conditions are not particularly disquieting because they are excluded by a further characteristic of motives, namely that they move the organism to act in *a direction* Apropos of the latter characterization is Shaffer's definition, namely motivation is "*that which arouses, sustains, and directs activity*" [3]

Adherence to the foregoing definitions forestalls the acceptance of nutrition as a motive Although the nutriment taken in and stored in the tissues is the source of all activity of organisms, it does not give direction to activity The nutritional state may be a factor in determining the activity level that a given motive will elicit, and some degree of activity is a necessary concomitance of being alive Moreover, the energy for all action is supplied by the acting tissues, not by the stimuli or the motives that may be operating

To repeat, that which arouses, sustains, and directs activity is some condition within the organism Motives are not considered to be external to the body They are not in the past, nor in the future, but are ongoing events It is not presumed to be a necessary condition of a motive that it be consciously rationalized – that one know why he is moved to act thus and so or that he understand the consequences of his acts Even in

[2] E R Guthrie, *The Psychology of Human Conflict,* p 103 New York Harper and Brothers, 1938

[3] L F Shaffer, *The Psychology of Adjustment,* p 84 Boston Houghton Mifflin Co, 1936

human behavior there are many instances of the operations of unconscious motives, as in the case of phobias and other instances of personality disturbance

Certain motivating conditions owe their origin to biological history Among these may be mentioned hunger, thirst, and reproduction and conservation-of-tissue motives, as well as migration and nest-building They come about as a necessary consequence of being a member of a species Needless to say, in human behavior, the great majority of motives are disturbances whose explanation is found in biographical rather than in biological history

Motives, like hunger, thirst, and pain, are conditions that dispose organisms to satisfy bodily needs and to perpetuate the species Each of these motivating disturbances has behind it an indefinitely long biological history So-called psychological motives may be regarded as mental needs, such as the satisfaction of our vanity, and self-esteem Motives of the latter class also have a history While the conditions that make them possible are brought to bear upon each individual during his lifetime, they may have a history as old as the race In discussing the invasion of Russia in 1812 Tolstoy writes

> Historians tell us that the causes of this event were the insult offered to the Duke of Oldenburg, the failure to maintain the continental system, the ambition of Napoleon, the firmness of Alexander, the mistakes of the diplomatists, and so on The more deeply we search out the causes the more of them we discover, and every cause, and even the whole class of causes taken separately, strikes us as being equally true in itself, and equally deceptive through its insignificance in comparison with the immensity of the result, and its inability to produce the effect that followed
>
> the first chance French corporal had he been unwilling to serve, and a second and a third, and thousands of corporals and soldiers had shared that reluctance the war could not have taken place It was essential that the millions of men in whose hand the real power lay should consent to carry out the will of these feeble persons, and that they should have been brought to this acquiescence by an infinite number of varied and complicated causes [4]

[4] L Tolstoy, *War and Peace*, pp 568–570 (Translation by C Garnett) New York Modern Library Reproduced by permission

Why did Napoleon think it his prerogative to let the blood of millions of men in the interest of peace and the edifice of humanity? Why did Alexander think he had to be firm and that he could lead his people into war in order to exercise this right to be firm? Why did the Duke of Oldenburg think his hard treatment by the French required expiation? Why did the feelings of the Emperors or of the Duke make any difference to the men who tugged at the baggage and charged the cannon with powder and grapeshot? At one level of description these questions can be answered in one word *education*. Emperors and men have so acted in the past. Good emperors and men have always so acted. Such action has been idealized in literature, art, song, and history. "The king is the slave of history" and so is each common soldier. History dictates the education of each person. To motivate a man — or a student — an appeal must be made to his past.

Function of motives. Motivation is a concept — a necessary concept in psychology. Motives are inferences, not observable psychological data. They pervade nearly all behavior. It is a serious question, for example, as to whether any unmotivated learning takes place. In a learning situation motives define the problem and determine the conditions of its solution. That is, a problem has been solved, in so far as the organism is concerned, when the motivating conditions have been satisfied. As McGeoch has said, a motive is "any condition of the organism which points it toward the practice of a given task and which defines the satisfactory completion of that task."[5] Not only do motives arouse and direct behavior, create learning situations and define the solution, they are also intimately connected with the act or process of learning. The re-enforcing mechanism (discussed in Chapter XI) presupposes a goal, which in turn is a function of motivation.

SOME ANIMAL EXPERIMENTS

As an orientation to the problems of motivation we may profitably examine some of the investigations of motivation

[5] J. A. McGeoch, "Learning," in E. G. Boring, *et al.*, *Psychology*, p. 312. New York: John Wiley and Sons, 1935.

conducted by animal psychologists We may here appropriately recall Herrick's dictum that in each case the nature of a response depends upon the nature of the stimulus and the nature of the stimulated protoplasm With a constant food stimulus or incentive an animal's reaction varies with the state of hunger — with the strength of the hunger motive With an objectively constant stimulus, the response will vary with the state of the organism However, with a constant state of the organism, the response will vary with the attractiveness of the incentive When appetite is great, a weak stimulus will suffice when appetite is very weak, a delectable food incentive is required

Presumably this is a condition of behavior sufficiently general to permit us to say that it applies in the classroom A highly motivated pupil may be expected to prosecute with tolerable industry tasks that a weakly motivated pupil would undertake with consummate indifference A sufficiently attractive task may engage the industry of the most slothful student No amount of persuasion at his wife's command could induce poor Rip to bestir himself with hoe or sickle, yet we are led to marvel at his ability to concentrate on his fishing gear and at his heroic indifference to over-flexed muscles, even without the encouragement of so much as a single nibble

The strength of motives and incentives The presence or absence of motives is indicated by the power of an incentive to evoke a response in a direction This bit of intelligence informs us about the nature of an animal — his bodily condition, the stage of his development and senescence After a motive is known to have made its appearance in the developmental life of an animal, more refined methods of studying its conditions are customarily employed, to wit (1) the choice method, (2) the obstruction method, and (3) the learning method

Investigations of Moss furnish illustrations of the first two procedures The relative strength of two competing motive-incentive conditions, hunger and sex, in the male rat was determined by so placing the animal in a compartment that he

could choose food or a mate in heat, but not both, each being equally accessible to him [6] The second procedure made use of what is known as the obstruction technique, as illustrated in Figure 14 The animal is placed in compartment *A*, the incentive in compartment *C* In order for the animal to reach the incentive, food, mate, nest, etc, it must cross an electric grill in *B* This technique has received considerable refinement by Warden [7] Calibration of the current to which the animal will submit with a specified frequency gives a quantitative index of

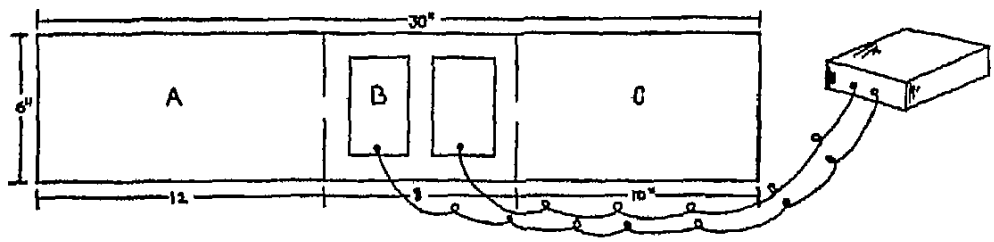


FIG 14 FLOOR PLAN OF MOSS'S OBSTRUCTION APPARATUS A, STARTING BOX, B, ELECTRIC GRIDS, C, FOOD BOX

the strength of a motive-incentive condition This method is also well adapted to the study of relative strength of different conditions

Both these procedures exemplify the fact that the manner in which an animal (or a person) will behave in a situation depends not only upon the strength of one motive and the attractiveness of one incentive, but also upon the strength and attractiveness of competing motive-incentive conditions Thus Moss writes "The behavior of any animal is the resultant of his drives to action and the opposing resistances" Resistance is best construed as a competing motive Resistance to gratification of the sex motive in the obstruction experiment is the avoidance-of-pain motive In the case of a man, resistance may be in the form of avoidance-of-social disapproval, and related motives, as if "taboos" were substitutable for "grill" Thus a

[6] F A Moss, "Study of Animal Drives," *Journal of Experimental Psychology*, 1924, Vol 7, pp 165–185

[7] C J Warden, *Animal Motivation Experimental Studies on the Albino Rat* New York Columbia University Press, 1931

change in performance may be effected by a change in resistances or, as we may say, in repelling motives, and by a change in the propelling motive-incentive conditions Whether or not a pupil gets up his lesson depends upon the strength of the motive-incentive conditions appropriate thereto and upon the strength of competing motives and incentives

Lewin applies the appellation *valence* to the situations just described The individual may find himself between two positive valences, like the rat which must make a choice between food and mate, or between a positive and a negative valence, as in the case of the rat in the obstruction box which is impelled toward food and away from the charged grill, or between two negative valences in which a choice is required between two "evils," as between toothache and dental ministration[8] The reflections of man are daily employed in weighing the issues involved in mutually exclusive courses of action The decision and consequent action must of necessity follow the stronger of the two competing tendencies, or the lesser of two unavoidable evils

A third method, which indeed is temporally first, of ascertaining the strength of motives and incentives is the learning method Incentives may be varied readily, the motive being kept constant This is done in testing relative strength of various food incentives, the period of food deprivation being constant The rank order of the incentives is presumed to be the same as the order of their productiveness of mastery of a constant task

A comparison of motives alone is experimentally more difficult because the testing of different *motives* requires the use of different *incentives* It is not readily possible to determine whether the obtained differences are due to the differences in strength of the motives or to differences in the attractiveness of the incentives

As examples of investigations of the effect of variations in food incentives upon speed of learning, the intensity of the hunger drive being putatively constant, the reader is referred

[8] K Lewin, *A Dynamic Theory of Personality* New York McGraw-Hill Book Co , 1935

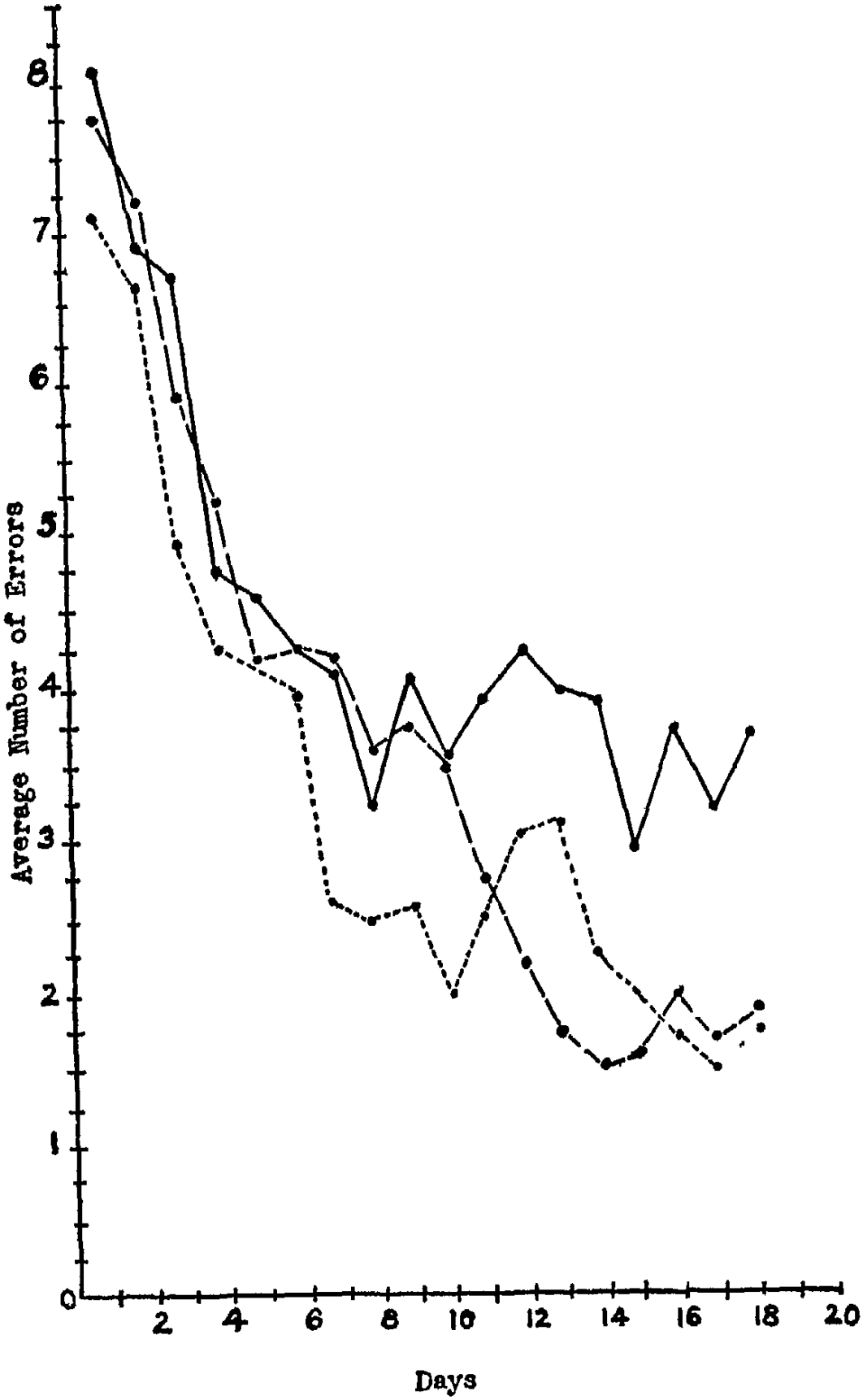


FIG 15 EFFECT OF APPROPRIATENESS OF INCENTIVES TO MOTIVATING CONDITIONS

to the work of Simmons [9] and Elliott [10] To the same purpose is Elliott's investigation of the effect of the appropriateness of the incentive to the motivational condition of the animal He put to the learning of a 14-unit multiple-T maze three groups of rats, one, *E*, being very hungry and very thirsty, another, *F*, being very hungry and only slightly thirsty, and another, *G*, being slightly hungry and very thirsty [11] During the first nine days a food incentive was used for all three groups, during the ensuing nine days, a water incentive Figure 15 depicts the progress of the three groups in terms of error elimination It is seen that there is value in appropriateness of the incentive to the motivating condition of the animal So long as food was the incentive the hungry-thirsty group made the most progress When water, instead of food, became the incentive, the thirsty group made the most progress, the hungry group made almost no progress under the stimulus of a water incentive, and the progress of the hungry-thirsty group was checked somewhat

The latter experiment gives some evidence of a dynamogenic effect of concomitant motives, even though the incentive be inappropriate to their satisfaction Under the stimulus of the food incentive the hungry-thirsty group made more progress during the first nine days than the hungry group, although this effect is not indicated during the second nine days That is, the hungry-thirsty group did not respond to the water incentive so well as did the thirsty group The dynamogenic effect of concomitant motives is also suggested in the work of Ligon in which it was shown that well-fed animals made slower progress in learning than did hungry animals, regardless of the incentive used and the motive appealed to [12]

[9] R Simmons, "The Relative Effectiveness of Certain Incentives in Animal Learning," *Comparative Psychology Monographs*, 1924, Vol 2, Whole No 7

[10] H M Elliott, "The Effect of Change of Reward on Maze Performance of Rats," *University of California Publications in Psychology*, 1928, Vol 4, pp 19–30

[11] H M Elliott, "The Effect of Appropriateness of Reward and of Complex Incentives on Maze Performance," *University of California Publications in Psychology*, 1929, Vol 4, pp 91–98

[12] E M Ligon, "A Comparative Study of Certain Incentives in the

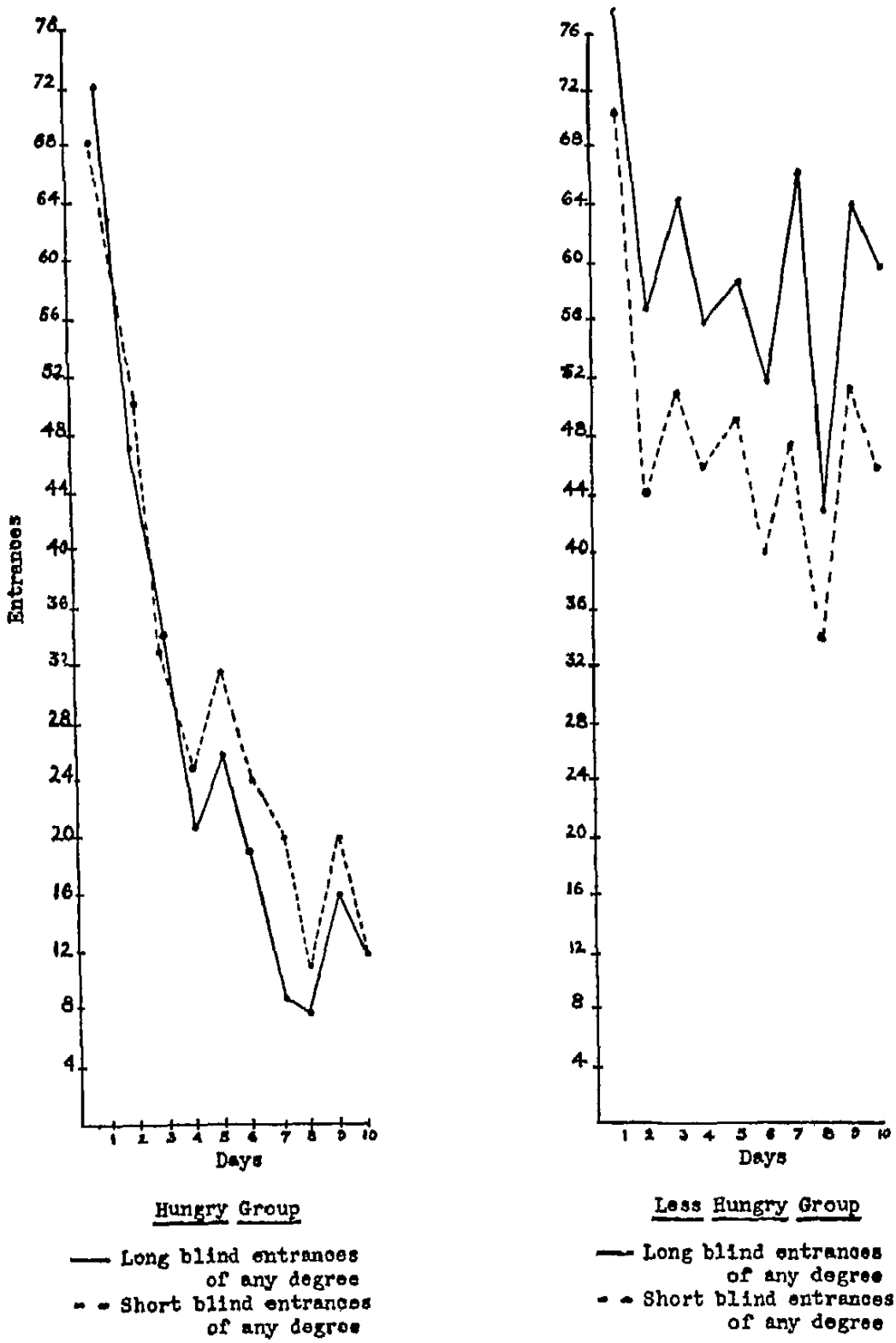


FIG 16 EFFECT OF STRENGTH OF MOTIVES UPON MAZE LEARNING

The comparative learning efficiency under different motives and incentives gives satisfactory evidence of their functional strength But this is not a very good method of studying the relationship between learning and the strength of the motives and incentives, except by inference, since by the method of selection those are strongest which are productive of the quickest learning If the problem is to determine the relationship between motivation and learning, the relative strength of the motives should be determined by independent criteria in advance, as by the obstruction or choice technique Since it is already known from the work of Moss that a correlation exists between the period of starvation and the strength of the hunger drive, it is legitimate to take the relationship obtained between learning efficiency and period of starvation as contributing evidence of the relationship between learning efficiency and the strength of motive As an illustrative example of this relationship some results of Tolman, Honzik and Robinson, as revealed in Figure 16, are given [18]

PRIMARY MOTIVES

An animal's freedom of action, in contrast with a plant, places upon his own initiative the responsibility for carrying out certain maintenance and reproductive functions The biologically fostered disturbances that urge animals to satisfy these conditions are said to be primary They are primary in the sense that they are the first motives that an organism has They are also primary in the sense of constituting the roots in which socially acquired motives have their origin Without this primary stock of motives it is difficult to see from what footing the secondary ones would arise

Some of the more obvious of the primary motives are the various conditions to which such labels as hunger, thirst, pain, and sex aspiration are attached The conditions that arouse,

Learning of the White Rat," *Comparative Psychology Monographs,* 1929, Vol 6, Whole No 28

[18] E C Tolman, C H Honzik, and E W Robinson, "The Effect of Degrees of Hunger upon the Order of Elimination of Long and Short Blinds," *University of California Publications in Psychology,* 1930, Vol 4, pp 189–202

direct, and sustain activity in the interest of rest, sleep, elimination, and maintenance of a comfortable surface temperature may also be listed among the primary motives Similarly classed are the conditions that in certain animals arouse, sustain, and direct migratory, maternal, hoarding, and nest-building behavior

The majority of recent writers upon the subject list emotional tensions as among the primary motives If they are motives at all, this listing is as it should be These tensions — by which is meant tension in muscles and glands — are themselves aroused and sustained, if not directed, activity Their function seems to be that of facilitating, energizing, and re-enforcing activity Whether or not they exert a directive function is problematical Tensions are symptomatic of a motivated condition

Emotions for the layman, by which he means fear, anger, hate, love, sympathy, and jealousy, and various admixtures, are certainly among the most powerful motives found in human existence But these are probably not primary Even if, for the sake of argument, we assume them to be primary, they are not the same as the emotional tension we study with instruments in the laboratory and describe in our textbooks in psychology Our efforts to isolate something that we can put apparatus on are all to the good, as is testified by the fact that practically all our knowledge of emotion is the result of these efforts Emotion shorn of feeling and "mental states" is not the same as emotion that includes them, and we are not permitted to say the same thing about the two conceptions Perhaps we have been guilty of imputing a meaning to one definition of emotion that is implicated only in another definition

Various appetences and aversions, or to the behavioristically oriented student, various adient and avoidant drives, deserve an assignment among the primary motives Such feelings as anger, fear, love, and hate have never been thoroughly analyzed They are probably not elemental, that is, they are probably complex mental organizations brought about by experience Elemental pleasantness and unpleasantness are prime constituents thereof

It is suggested that pleasantness and unpleasantness and pain are quite as ubiquitous as tensions and quite as useful in the behavior of man and animal, though certainly not so readily studied In any being that cannot make a verbal report, even their presence or absence is a matter of inference But they are none the less facts of nature because we cannot see, hear, or touch them At a workable level of description it is enough to observe that organisms, without learning, display tendencies to go to and maintain certain situations and to flee from and avoid others In the normal course of learning these same response tendencies become connected with other situations

In human behavior, feeling seems to be an important constituent of most if not all primary and secondary motives However, one may avoid the use of pleasantness and unpleasantness, in favor of adient and abient drives if he feels more like a scientist in doing so However, it should be understood that drives, adient or abient, are not observable data, but are inferences They are inferences quite as much as feelings are, more so at the human level, because a human being can observe his own feelings, but not his drives

SECONDARY MOTIVES

Elaboration of primary motivators Conditioned response phenomena afford a useful framework within which to cast the treatment of the elaboration of motives The sight or smell of delectable food, or a symbolical representation thereof, may arouse a quiescent food appetence Presumably, at the outset of life hunger sensations arising in the stomach are the only adequate sources of stimulation It is customarily assumed that through the normal processes of conditioning substitute stimulation becomes connected with the food reaction

Although the principle of conditioning affords a satisfactory explanation of how the elaboration takes place, a bit of caution should be exercised in appraising the result There is no good reason to suppose that the nature of the food appetence remains the same, that the only change that has taken place is in respect to its arousal by substitute stimulation The two appetites are not necessarily the same, the "educated one"

may contain elements not found in the original For example, aesthetic and social aspects may be added, the dinner hour is a period of rest and relaxation There is ego gratification in a sumptuous table and the appetite is re-enforced by many pleasurable gustatory consequences of previous eating In effect, learning modifies the nature of the motive as well as the conditions that set it in operation A certain phenomenon of conditioning affords an analogy The conditioned reflex is not the same response as the "uneducated" reflex It has more the properties of a voluntary act than a reflexive one

Similarly, modification in the nature of the motive and in the conditions of its arousal takes place in man with respect to all of the biological motives One does not in the normal course of affairs select a mate, purchase a garment or a home or an article of food or drink merely out of consideration of their satisfaction of his biological needs In all, his vanity gets consideration It is not winter's chill but his desire to appear to advantage that normally sends a man to his tailor Were there not organic requirements, there might well be no houses or clothing or marriages But whatever the standpoint from which we regard man we may see a tendency for his biological forms and functions to take on a significance over and above the natural run of biological economy When opinion is vouched regarding the merits of a pair of human hands, or eyes, or ears, or of limbs, hair, lips, or epidermis, we may be pretty certain the critic is not thinking of their physiological efficiency A dentist may appraise teeth from the standpoint of their masticatory office A professor of physiology may have occasion to think of lips in terms of their vegetative function, and so may an optometrist, a kinesiologist and other professional men have interests in the biological efficiency of these external structures of the body But most of us think at once of their aesthetic properties when an evaluation is placed upon them

One might expect that the man of the Western Pacific Islands would, amid tropical abundance, restrict himself in the interest of food no more than the bare exigencies of physical necessity require, that he, if any one, would follow the line of least resistance in such matters Indeed, there may be groups among

which such is the case, although they do not appear to be the rule It is conceivable that even the first culture people (Chapter III) take pride in shaping a good digging stick or gain some renown as a good digger of roots and bulbs

Malinowski tells us that the labors of the Trobriand Islanders are not actuated entirely by economic motives, nor bent merely toward the satiation of primordial needs, imminent or remote Their work is prompted by "motives of a highly complex, social and traditional nature " The worker takes scrupulous care of his communal plot of ground, doing much more work than is required, and adding "aesthetic polish" for his own rather than his garden's good He takes pride in the amount of work he can do, the size of plot he can till, and in the bounty of his harvest, the latter being carefully displayed for inspection in his own garden, and vies with others in speed and thoroughness The title *tokwaybagula*, good gardener, gives its bearer prestige The produce beyond personal needs is given to one's relatives-in-law He is guided by a "very complete set of traditional forces, duties and obligations, beliefs in magic, social ambitions and vanities" [14] *Vanitas Vanitatum* is as appropriate to the Trobriander's world as to Thackeray's

McDougall, throughout his long and eventful history, was an advocate of the thesis that the varied and complex forms of motivation in man have their bases in the so-called primary drives or propensities, as was James and others before him More recently, and perhaps more explicitly, Shaffer has developed the same idea [15] He suggests that the *mastery motives* — the urges to excel, to succeed, to overcome obstruction — are elaborations of rage, that the *social approval motives* — urges to seek approval, to gain attention and sympathy — are elaborations of the adient drives, and that the *conformity motives* — urges to conform and to avoid condemnation — are elaborations of fear [16]

[14] B Malinowski, *Argonauts of the Western Pacific*, pp 58–62 London George Rutledge and Sons, Ltd , 1922

[15] W McDougall, *The Energies of Men* New York Charles Scribner's Sons, 1932

[16] *Op cit*, pp 100 ff

Second order elaboration The meaning of second order elaboration, as used here, is continuous with the meaning of second order conditioning Stimulus b becomes a conditioned stimulus for response R_1 by virtue of coeval presentation with unconditioned stimulus a which is innately adequate to R_1 This is first order conditioning But stimulus c may in turn become a conditioned stimulus for R_1 by virtue of coeval presentation with b This is known as second order conditioning Perhaps the vast majority of interests, wants, and attitudes represent at least second order conditioning [17] In fact they are of such great complexity that nothing very useful can be said about their origin, except that they are probably organized out of simpler elements

Functionally autonomous motives Well taken is Allport's concept of functional autonomy of motives, previously referred to (Chapter VIII) While secondary motives are regarded as springing from primary motives, they are not supposed to derive their force therefrom They are self-sustaining "Just as a child gradually repudiates his dependence on his parents, develops a will of his own, and becomes self-active and self-determining, and outlives his parents, so it is with motives" [18]

Characteristics of human motivation There is no advantage in attempting to make a list of secondary motives Such a phenomenon as intellectual curiosity, love of music, or interest in epic poetry is inextricably complex Let us consider an issue very close to home Why does a man wish to succeed as a teacher? What sends him working long hours each day, without consideration of pay for overtime and holidays? Is it concern for the education of his students, is it to avoid embarrassment by some precocious member of his class, or to satisfy his vanity, to earn a reputation, to find security in the esteem of his colleagues, is it because he feels pleased with himself when he does well and displeased when he does poorly, or

[17] *Cf* D G Ryans, "Motivation and Learning," *Psychology of Learning,* Forty-first Yearbook, Part II, pp 289–331, National Society for the Study of Education Bloomington, Ill Public School Publishing Co, 1942

[18] G W Allport, *Personality,* p 194 New York Henry Holt and Co, 1937

because he is concerned about the welfare of his family, which prospers in proportion as his income and reputation prosper? It is all of these and more Moreover, these conditions are interrelated with one another and mutually re-enforcing For example, a man's solicitude for his family is prompted in part by his vanity No one of the suggested motivating conditions is primary, in the usual meaning of that term A very mediocre professional stature will assure a man the gratification of his organic needs with respect to food, clothing, shelter, and a family In fact if he will but show sufficient indolence, modern society will provide them for him in a competency quite commensurate with his animal requirements

SOME EDUCATIONAL CONSIDERATIONS

What does it mean to be interested in a lesson, a course of study, or in school? What sort of needs do these academic desiderata satisfy? They are a means of ego gratification, as is any pursuit that has on it a stamp of social approval, of realization of feelings of security Some of the motives to scholastic endeavor may be satisfied quite as well by curricular content that has a minimum of perceived utility However, as seen in Chapter XIII, there is reason to believe that pupils will experience a greater sense of security in working at tasks that seem educationally worthwhile It is difficult to see how constant or recurring experiences of futility as a pupil applies himself to his lessons can do other than lead to a feeling of insecurity

There is an obligation in education to provide a curriculum of the greatest possible social usefulness and one calculated to effect maximum mental development But it does not follow that the pupils will necessarily and of their own accord feel any great need of what it contains This need may have to be developed It is important that the educational program have the loyal support of the group The most dependable motives are those that are capable of proximal satisfaction While a person may work diligently and protractedly toward a remote end, the chances of his doing so are much enhanced if he derives some present satisfaction therefrom — if his doing so

fulfills a present need Thus it is not sufficient that a curriculum have ultimate social utility, it should appeal to the pupils as being worth their while here and now Proximal gratification in connection with scholastic achievement is derivable from ego gratification and avoidance of its opposite, new or interesting experiences and the avoidance of boredom, desire to please, to conform, to avoid censure, and feelings of adequacy and security

Social control While it cannot be gainsaid that the school's first duty is to provide an educational program of the greatest possible worth to the pupils, its second duty is to gain the pupils' approval of this program and their loyalty to it In behalf of the latter duty we may profit by a glance at some of the forms of social control everywhere found Society applies punitive measures of varied kind and degree to those who flagrantly violate the mores, as is well known to all However, these measures as such are in most instances feeble as over against the fact that they stand as society's expression of disapproval Neither legal or ecclesiastical authority is of much avail unless backed by public opinion Consequently, it is of the greatest importance that the school's educational program have the support and confidence of the pupils and the community, because such support and confidence will have great coercive power upon those pupils who are otherwise indifferent about their lessons

In further support of the contention that the school cannot safely rely, for motivational purposes, solely upon the merit of its educational program, attention is called to the main emphasis of Chapter I, namely that many of our pupils come to school without sufficient spontaneous interest to carry them forward Their home life has not provided this interest When we attempt, as we do in our American schools, with respect to immigrant and underprivileged youth, to span several generations of normal development in a single generation, we must create and sustain the necessary interests When education becomes a means not merely of perpetuating society, but also a means of its growth, as large segments are by schooling elevated to a higher social stratum, many youth are not culturally

ready Thus we should first devise the best educational program we can and then attempt to re-enforce it by the best forms of social control we are able to apply, keeping in mind that it is desirable that the whole community be back of the school's work

Ceremonial is one of the oldest forms of social control Primitive tribes have achieved all but the ultimate in group solidarity Conflicting mores are scarcely to be tolerated Undoubtedly, the unending ceremonial usages have great welding power Notwithstanding this power, it is frequently difficult to induce the members of the school faculty to attend commencement and assembly exercises Perhaps many of our schools stand in need of better traditions and more ceremonial functions

"The thoughtful penalize peculation, ballot frauds, and the neglect of fires in the forests, while the foolish public is gnashing its teeth at vaccinators and body snatchers" [19] The foolish devise schemes for punishing minor infractions of the school code or seek some implement for motivating pupils to complete their themes by Friday, the wise look to the more fundamental question of school morale Both teacher and school require tremendous prestige Government and industry have long since realized the importance of good will and have expended large sums of money in an effort to promote it As compared with high morale upon the part of students, instructors, and administrative officers, conventional devices for maintaining order, for punishing infractions of the school code, and for motivating pupils to execute their daily assignments seem petty indeed Our schools could do with better advertising than they have had If advertising dictates what we shall eat and wear, how we shall sleep and spend our leisure hours, then it may be counted upon to make pupils learn

Certain important lessons may be gained from studying the methods of instruction employed in the home, in the primary grades, and in primitive tribes It may be noted that they all have something to offer the child that seems vital to him They

[19] E A Ross, *The Principles of Sociology*, p 430 New York D Appleton-Century Company, 1921

afford an obvious means of growing up, of becoming responsible members of the group They afford an escape from childhood Should we be able to convince students at all academic levels that prosecution of the school's educational program is a means of growing up, the problem of motivation would be considerably reduced Again turning to the history of primitive tribes, we note the untold hardships to which the youth willingly and eagerly submit in order to win their status as adults At the secondary level, education is offered millions of youth which is novel to them They have not seen it in action in the home In another generation the majority of parents will have had a high school education It should then be easier to give their children a similar education

It sometimes comes to pass that conflicting mores of gangs and cliques and other types of organization, both formal and informal, among adolescents develop in sufficient force as to constitute a menace to the educational program As suggested above, the remedy would seem to lie in the direction of improving morale and strengthening group solidarity

The educational program should be so ordered as to afford a means of self-expression and ego gratification Schools should avoid as a plague the antipathies that sometimes arise between pupil and teacher There should be maintained a spirit of camaraderie among students and instructors in the quest of knowledge When this condition prevails in full measure indifferent members of the student body may be expected to respond to the coercive influence of group opinion We may also gain from social psychology some important lessons about the effects of attempts to force customs, beliefs, and knowledge upon people before they are ready for them

Artificiality of human motives There is reason to believe that man's inborn urges are animal in character Those that we recognize as being peculiarly human seem to be acquired They are, therefore, in a sense artificial Man does not have to learn how to be hungry, thirsty, sleepy, or cold, or to hurt when his tissue is injured These impulses he possesses in common with the lower animals On the other hand, man not only must learn to read, if he is ever to come by this skill, he

also must learn to want to read In the same way he must learn to want to learn arithmetic, geography, and all other school subjects if these wants are to materialize Why should a person wish to learn, anyway? Partly for the same general reason he wishes to wear shoes or carry a watch they have a certain utility, they also put him in style Through them he may satisfy his vanity and make himself appear to advantage, they have on them the stamp of social approval He may also wish to learn because he perceives his learning activities as a means of his mental development

Were the urges to learning inborn we should expect to find them in greatest strength amongst those who have made the least progress in satisfying them It is a singular fact that the chief enemies of illiteracy are the literates, not the illiterates The fact that motives to learning in school are artificial should not disturb us At any hour we may witness men performing satisfactorily under the impetus of socially acquired motives If these commonplace events are unconvincing we may recall the fact that thousands of persons have mutilated their bodies in order to make themselves appear to advantage in a social group, that priests of the Middle Ages often slept in the cold and on thorns for religious purposes, that men have fasted for the same reason, sometimes unto death, or voluntarily robed themselves in sackcloth, that persons have starved in preference to eating tabooed foods

INVESTIGATIONS OF MOTIVES AND INCENTIVES

Competition and rivalry Competition itself is not a motive There is no warrant for assuming the existence of a competitive motive which arouses, directs, and sustains behavior Competition is itself motivated — it is a response made to certain motivating conditions and exists because there are others who are similarly motivated Striving for mutually desired goals is not the only motive to competition, the mastery or self-assertive motive is another Competition is a means of implementing the mastery motive Two pigs may compete for the same ear of corn To win or lose means satisfaction or non-satisfaction of a condition of hunger Most likely, questions of

pride, status, and ego satisfaction do not arise In human behavior such questions arise in connection with most competitive activities, especially those that carry considerable prestige

Two kinds of competition have been recognized, experimentally self-competition and competition with one or more persons In the latter instance competition may be personal — in which one individual competes against others, or social — in which one group competes against another group Provision is rather easy to make, in so far as experimental procedure is concerned, for the various competitive situations, although there is nothing to prevent a subject's going beyond or contrary to the experimental instructions In many kinds of social competition or teamwork, for example, a performer may be quite concerned about his own contribution to the team as gauged by his relative standing on the team, and thus compete with his own teammates at the same time he is competing as a member of the team with a rival team Moreover, as Vaughn and Diserens point out, competition in some form or other may very well be present in pursuits where no experimental provision has been made for it [20] This is seen very clearly in some of the attempts that have been made experimentally to eliminate it, as, for example, in Allport's investigation of the influence of the presence of others on individual performance [21]

(1) *On the value of competition* That competition affects human behavior is readily seen in a great variety of activities — lovemaking, military training, business, and nearly every activity In psychological literature one of the earliest published investigations was that of Triplett on pacemaking and competition in bicycling and other forms of motor activity [22]

In 1900 McGhee called attention to the preponderant position that plays and games involving competition have among children between the ages of 6 and 18 years He found that

[20] J Vaughn and C M Diserens, "The Experimental Psychology of Competition," *Journal of Experimental Education*, 1938, Vol 7, pp 76–97

[21] F H Allport, "The Influence of the Group upon Association and Thought," *Journal of Experimental Psychology*, 1920, Vol 3, pp 159–182

[22] N Triplett, "The Dynamogenic Factors in Pacemaking and Competition," *American Journal of Psychology*, 1898, Vol 9, pp 507–533

interest in competitive games also increased steadily within this age range [23]

The earliest investigation, to the writer's knowledge, of the influence of competition in school learning is that of Bykowsky in 1923, in which competition is alleged to have stimulated increased effort [24] In 1924 Spear induced competition in a classroom experiment by offering prizes for the best work in various activities in science classes In a second such experiment knowledge of results achieved on frequent short-answer tests was made the basis of competition [25] The object of Spear's article was to demonstrate practical methods of inducing competition In the same year, as related by Hurlock, J Muller found competition to have a greater influence upon performance in arithmetic than did an appeal to utility and altruism [26]

One of the most widely quoted investigations of competition is that of Hurlock [27] Her subjects, 155 intermediate grade pupils, were divided into two matched groups — a "rivalry group" and a "control group" The control group was segregated and engaged in exercises in arithmetic computation in the usual way The rivalry group was subdivided, forming two matched groups, and pitted one against the other [28] The names of the members of the winning group were read at the beginning of the next exercise The average score of the winning group was written on the blackboard The author reports that genuine, wholesome rivalry prevailed Both the rivalry and

[23] Z McGhee, "A Study in the Play Life of Some South Carolina Children," *Pedagogical Seminary*, 1900, Vol 7, pp 459–478 See also G E Johnson, "Education by Plays and Games," *Pedagogical Seminary*, 1894, Vol 3, pp 97–133

[24] Cited by J B Maller, "Co-operation and Competition An Experimental Study in Motivation," *Teachers College, Columbia University, Contributions to Education*, No 384, 1929

[25] W W Spear, "A Practical Method for Arousing Pupil Competition," *School Science and Mathematics*, 1924, Vol 24, pp 23–27

[26] E B Hurlock, "The Psychology of Incentives," *Journal of Social Psychology*, 1931, Vol 2, pp 261–289

[27] E B Hurlock, "The Use of Group Rivalry as an Incentive," *Journal of Abnormal and Social Psychology*, 1927, Vol 22, pp 278–290

[28] See also J Zubin, "Some Effects of Incentives A Study of Individual Differences in Rivalry," *Teachers College, Columbia University, Contributions to Education*, No 532, 1932

control groups made substantial gains, but the net gain owing to rivalry, as determined by subtracting the gain of the control group from that of the rivalry group, was substantial and statistically significant

Hurlock's experiment lasted but one week It seems quite likely that interest in such a procedure would fail in time It is suggested that such forms of competition may be profitably induced when other forms of motivation lose their edge Chapman and Feder found that the effectiveness of competition against the previous day's performance was not diminished at the end of a 10-day period, the limit of their experiment [29]

The availability of competition as a medium for stimulating work in school is bolstered by its demonstrated effectiveness in other fields, notably in industry The reader's attention is called to investigations by Whittemore and Scott, in substantiation of the latter [30]

(2) *On kinds of competition* Sims has compared individual competition with group competition – competing as a member of a group without opportunity for individual recognition [31] Twelve practice periods were allowed He concluded that under the conditions of the investigation individual motivation is vastly superior to group motivation

This finding of Sims is corroborated by a well-designed experiment by Maller In his attempt to answer the questions (1) *What are the relative effects of competition and co-operation?* and (2) *Which type of motivation do children prefer to work under?* Maller arranged the following conditions (1) in which no form of experimentally induced motivation was used, (2) in which pupils competed for individual prizes, (3) in which pupils competed for a group prize, (4) in which pupils

[29] J C Chapman and R B Feder, "The Effect of External Incentives on Improvement," *Journal of Educational Psychology*, 1917, Vol 8, pp 469–474

[30] I C Whittemore, "The Influence of Competition on Performance An Experimental Study," *Journal of Abnormal and Social Psychology*, 1924, Vol 19, pp 236–253 W D Scott, *Increasing Human Efficiency in Business*, pp 10 ff New York The Macmillan Co, 1923

[31] V M Sims, "The Relative Influence of Two Types of Motivation on Improvement," *Journal of Educational Psychology*, 1928, Vol 19, pp 480–484

were allowed to choose between working for individual and group prizes, and (5) in which immediate and continuous effects of the two incentives were appraised The subjects were 1538 pupils from Grades 5 to 8 The task was adding one-place numbers Competition for individual prizes proved to be significantly superior to competition for group prizes

Fatigue decrements were much greater under the condition of group competition than under individual competition When allowed to elect the condition under which they were to work, three times as many pupils chose individual competition as chose group competition [82]

(3) *The influence of a social situation.* Not unrelated to competition is the question of the effect of the presence of others upon performance, although competition is probably not the only factor operative In 1904 Schmidt, Mager, and Meumann made comparisons between solitary work and work done in the presence of a group [83] The former compared the competency of home work in written composition and in arithmetic with that done within a social situation — the classroom Mager compared performance in a classroom, the teacher alone being present, with that done in the classroom as a class exercise Meumann compared the performance of pupils 13 to 14 years of age on the ergograph and dynamometer under three conditions (1) teacher present, (2) class present, and (3) teacher and class present In all these investigations the so-called social situation proved to be superior to the solitary situation, and the larger the group, the more effective it was

Subsequent work and that, on the whole, more nearly simulating the normal learning situations of the school corroborates the foregoing Allport's [84] investigation of the influence of the group on association and thought, Gates',[85] on the influence

[82] *Cf* G Forlano, "An Experiment in Co-operation," *Journal of Educational Research*, 1932, Vol 25, pp 128–131 P Sorokin, *et al*, "An Experimental Study of Efficiency of Work under Various Specified Conditions," *American Journal of Sociology*, 1930, Vol 25, pp 765–782

[83] From Vaughn and Diserens, *op cit*

[84] F H Allport, *op cit*

[85] G S Gates, "The Effect of an Audience upon Performance," *Journal of Abnormal and Social Psychology*, 1924, Vol 18, pp 334–344

of the size of the audience on performance on the Three-Hole Test, a color naming test, and a vocabulary test, Breed and McCarthy's,[36] on the effect of the size of the class on failure and promotion, and Barton's,[37] on achievement in algebra taught by the methods of group discussion and individual assignments, are cases in point.[38]

Apparently there is present a social influence over and above the factor of competition, although to be sure the latter is difficult to eliminate experimentally. Griffith's finding that in large classes (college) seated alphabetically, the most unfavored positions from the standpoint of marks received, are the front and back rows, is a case in point.[39]

Individual differences in reaction to competition. (1) *Relative ability.* Maede found that the poor performers benefited more from the group influence (as opposed to working individually) than did the good performers.[40] Hurlock found that the effects of rivalry between groups was more pronounced among the inferior workers than among the average and superior workers.

We are not warranted, however, in assuming from the foregoing that pupils of inferior ability are more responsive in general to competition than pupils of good or superior ability. In competition with other individuals, where personal prowess is in jeopardy, poor performers would probably not respond well to the stimulus of competition, unless there were a reasonable chance of winning, *i.e.*, unless matched with another or others of somewhat comparable ability. Greenberg, in studying the growth and development of competitiveness in children, found ability as well as age to be associated with willingness to com-

[36] F. S. Breed and G. D. McCarthy, "Size of Class and Efficiency of Teaching," *School and Society*, 1916, Vol. 4, pp. 965–971.

[37] W. A. Barton, "The Effect of Group Activity and Individual Effort in Developing Ability to Solve Problems in First Year Algebra," *Educational Administration and Supervision*, 1926, Vol. 12, pp. 512–518.

[38] See also J. F. Dashiell, "An Experimental Analysis of Some Group Effects," *Journal of Abnormal and Social Psychology*, 1930, Vol. 25, pp. 190–199.

[39] C. R. Griffith, "A Comment upon the Psychology of the Audience," *Psychological Monographs*, 1921, Vol. 30, Whole No. 136, pp. 36–47.

[40] Vaughn and Diserens, *op. cit.*

pete [41] In his experiments with the dynamometer, Maede observed that competition proved to be most effective when the pupil was matched with a good rival Most likely the temperament of the individual is an important factor in determining the optimal conditions of competition It is thinkable that some, especially those suffering from deep-seated feelings of inferiority, may benefit most from rivalry when pitted against someone over whom there is a good chance of winning

TABLE LIV

PERCENTAGE OF CHILDREN EXHIBITING COMPETITION

Age Group	Present	Absent	Doubtful
2–3	0 0	89 5	10 5
3–4	42 6	55 6	1 8
4–5	69 2	23 1	7 7
5–6	75 4	15 8	8 8
6–7	86 5	5 4	8 1

(2) *Age* The primary purpose of Greenberg's investigation was to study the age factor in competition in young children The presence or absence of rivalry was determined by direct observation of the behavior of children as they were engaged in block building Table LIV summarizes her results Leuba obtained corroborating results the year following His subjects (33 children 2 to 5 years of age) worked singly and in pairs at the task of placing pegs in a peg-board The two-year-old children seemed to be relatively uninfluenced by the presence of another child working at the same task Some of the three- and four-year-old children displayed rivalry but were hindered by it, the five-year-old children exhibited definite tendencies toward rivalry and, in terms of output, benefited thereby [42]

Various investigations have yielded incidental data pertain-

[41] P J Greenberg, "Competition in Children An Experimental Study," *American Journal of Psychology*, 1932, Vol 44, pp 221–248

[42] C J Leuba, "An Experimental Study of Rivalry in Young Children," *Journal of Comparative Psychology*, 1933, Vol 16, pp 367–378

ing to the relationship between age and competitiveness of school populations As reported above, McGhee found that interest in competitive games increased steadily from age 6 to age 18, the age ranges studied For children of school age it is probably futile to attempt to investigate the question of age and competitiveness in general A more useful procedure would be the study of the age effects upon specific and educationally feasible forms of competition The finding that the effectiveness of competing for prizes, for example, decreases after a certain age would not *per se* indicate a decline in competitiveness in general We should expect that pupils would show a marked age differential in the things for which they compete, but this in itself would not show that the competitive spirit is any stronger at one age level than at another

(3) *Sex differences* Of the various investigations cited above, that of Maller is the only one that makes any extensive analysis of sex differences While the differences are not marked, girls, by his results, tend to benefit more from competition than boys This holds for both types of competition utilized in his experiment, namely competing for an individual prize and for a group prize This result, while in need of verification, should at least call into question the popular notion that girls do not do so well under competitive conditions as boys

(4) *Limitations and safeguards* In studying the conditions of competition in school it should be understood that we do *not* thereby commit ourselves to continual use of competition as a teaching procedure Doubtless there are many occasions when wholesome rivalry can be used to good advantage, and indeed it would be impossible to eliminate competition were it desirable to do so, but it should not be so used nor allowed to develop in such a way as to interfere with the social spirit of comradeship and mutual helpfulness Competition sometimes becomes a means of fostering an undue emphasis on speed of performance As is indicated presently, our first reliance, as we attempt to motivate our pupils, should be upon the social stimulus of working with and talking about the materials of instruction

Praise and reproof Perhaps the dominant motive in rivalry is mastery, although others, notably social approval, are doubtless present The dominant motives to which the incentives *praise* and *reproof* appeal appear to be social approval and conformity, although these are probably not unmixed with others, for example the mastery motive

One of the earliest recorded experiments on the effect of praise (more properly encouragement) upon performance was made by Binet and Vaschide [43] Encouragement uniformly accelerated improvement in performance on the tasks in question, namely the ergograph and hand dynamometer One of the earliest experiments on the effect of encouragement and praise on performance in school situations was conducted by Kirby in connection with his investigation of practice He reports marked positive effects [44]

The first investigator, to the writer's knowledge, to make a direct comparison between the effects of praise and reproof upon performance was Gilchrist [45] Gates and Rissland repeated the procedure of Gilchrist, adding a third condition, that of ignoring the performances Their subjects, college students, were divided, without regard to initial performance, into three methods groups (1) praised, (2) reproved, and (3) ignored The effectiveness of the three treatments, as judged by subsequent performance ranked in the order mentioned The poor performers reacted adversely to reproof They alone made less gain than the ignored group [46]

Hurlock carried out a similar experiment on pupils of Grades 4 and 6, the effect of the various treatments being compared during five consecutive class periods [47] The pupils were di-

[43] A Binet and E Vaschide, "Experiences de Forces Musculaire et de Fond chez les Jeunes Garçons," *L'Anné Psychologique,* 1897, Vol 4, pp 15–63

[44] T J Kirby, "Practice in the Case of School Children," *Teachers College, Columbia University, Contributions to Education,* No 58, 1913

[45] E P Gilchrist, "The Extent to Which Praise and Reproof Affect a Pupil's Work," *School and Society,* 1916, Vol 4, pp 872–874

[46] G S Gates and L Q Rissland, "The Effect of Encouragement and of Discouragement upon Performance," *Journal of Educational Psychology,* 1923, Vol 14, pp 21–26

[47] E B Hurlock, "An Evaluation of Certain Incentives Used in

vided into four approximately equal groups (1) praised, (2) reproved, (3) ignored, and (4) a control The latter was segregated, the remainder comprised three within-class groups Two groups were brought before the class, one group at a time, and roundly praised or censured for their previous performance Nothing was said to the ignored group Table LV shows the results

TABLE LV

EFFECT OF PRAISE AND REPROOF ON PERFORMANCE

Groups	Averages				
	1st day	2nd day	3rd day	4th day	5th day
Control					
Boys	13 45	13 91	13 18	12 18	11 81
Girls	10 60	11 20	10 54	9 26	10 33
Praised					
Boys	13 16	17 34	19 83	19 00	20 58
Girls	10 73	16 00	18 06	18 66	19 93
Reproved					
Boys	13 25	18 08	17 00	15 16	16 66
Girls	10 73	15 40	12 13	11 73	12 20
Ignored					
Boys	13 54	16 73	17 25	14 00	13 82
Girls	10 60	12 33	12 46	12.13	11 33

The praised group alone gained by a statistically reliable amount over the control group The comparative effects of the methods treatments on boys and girls raises an interesting question of sex differences, but since the differences here presented are unreliable, no conclusions can be drawn regarding the matter

In a different attack Briggs secured subjective reports from a group of graduate students (N = 370) as to various conditions

School Work," *Journal of Educational Psychology*, 1925, Vol 16, pp 145–159

that affected their performance in high school[48] Table LVI gives some of the conditions together with the judgments relative to their effects In such matters the judgments probably reflect likes and dislikes as well as opinions of the effects of the incentives upon performance

TABLE LVI

JUDGMENTS AS TO THE EFFECT OF VARIOUS KINDS OF INCENTIVES, IN PER CENT

	Effect on Work		
	Better	Same	Worse
Reprimand before others	40 4	13 3	46 2
Reprimand in private	83 1	9 9	6 9
Sarcasm before others	10 0	12 9	77 1
Sarcasm in private	18 2	16 9	64 9
Ridicule before others	7 2	23 8	69 0
Ridicule in private	21 2	15 2	63 6
Friendly conference	95 6	3 9	4
Public commendation	90 6	8 3	1 1
Work for teacher best liked	95 1	3 8	1 0
Work for teacher least liked	5 9	26 9	67 2

It may be taken for granted that there are individual differences with respect to the relative effectiveness of commendation and reproof In all probability there are differences in the effectiveness with which teachers administer the two kinds of incentives Even so, the weight of experimental evidence is such as to give the teacher who uses reproof and sarcasm as a habitual device cause to revaluate his motivational procedures

Knowledge of results Knowledge of results is implicated in several of the investigations described above It is sometimes made the basis of competition, and of praise and reproof Knowledge of results has meant three different things in psychology and as such has three different histories Naturally, data obtained in respect to one of its meanings are not imme-

[48] T H Briggs, "Praise and Censure as Incentives," *School and Society*, 1927, Vol 26, pp 596–598

diately applicable to another of its meanings Experiments of the Judd-Spencer type are the temporal antecedents of the other two types, but actually have no logical connection with them [49] They deal with a type of learning situation in which knowledge of the outcome of a performance is essential to the solution of a task Those of another type refer to "reinforcing effects" – a phenomenon that has been treated in connection with the law of effect

With respect to its third meaning, and the one that concerns us here, experimenters have sought to determine the effect of knowledge of achievement in a task upon subsequent performance in a similar task Knowledge, *qua* knowledge, is not an incentive Knowledge of results is an expediency by which competition is induced, by which success and failure are indicated, by which the ego is gratified or piqued, the effectiveness of which is a function of the motives that are operating More especially the practical result of informing a pupil of his performance in school will depend upon the level of his aspiration and the value he places upon achievement in the activity in question In practical school procedure another matter of importance is the confidence the pupil has in the validity of the scores

In view of the multiplicity of factors involved it would be surprising if the results of experiments on the effect of knowledge of results should be so uniform in trend as those on competition and praise and reproof, except in those instances in which competition and other factors are superadded

Symonds and Chase compared, in the case of several hundred sixth grade pupils, the effects of practice on English usage in three conditions Under one condition no experimentally induced incentives were applied [50] Under the second condition the pupils were apprized of their previous achievement and exhorted to do better on the exercise at hand Under the

[49] C H Judd, "Practice without Knowledge of Results," *Psychological Monographs*, 1905, Vol 7, pp 185–198 L T Spencer, "The Effects of Practice without Knowledge of Results," *American Journal of Psychology*, 1923, Vol 34, pp 107–111

[50] P M Symonds and D H Chase, "Practice *versus* Motivation," *Journal of Educational Psychology*, 1929, Vol 20, pp 19–35

third condition, an attempt was made to interest the pupils in improving their own English usage, for its own sake, so to speak The appeal was made on the ground that correct English usage is desirable, that the exercise at hand would give them an opportunity for improvement Thus, in one instance, achievement on the drill exercises was emphasized, in the other the more remote, abstract ideal of achievement for its own worth was featured In some measure this experiment constitutes a test of the relative value of immediate and remote rewards, a question raised in an earlier part of this chapter

The procedures designed to induce intrinsic motivation were completely ineffective in the sense that the group working under this condition gained no more than did the control group Test-motivation proved to be quite effective The group working under this condition gained about as much in 3 practice periods as did the control group in 10 practice periods From the standpoint of motivation the most important condition is that which elicits an effortful, zestful attack A pupil who studies in order to worst a rival, to please his parents, to gratify his ego, to earn a good mark or win an honor probably stands to learn as much as a pupil who works with equal zest in order to become a cultured citizen When a student learns, he has the learning It is admitted that some kinds of motivation may be more valuable than others from a long-time point of view Interest is one such possibility, although this is not a foregone conclusion *Interests change* It is not at all certain that they are more permanent than love of credit

Laboratory investigations of Arps,[51] Johanson,[52] and Book and Norvell[53] have yielded results in favor of informing subjects relative to their performance on each trial

In school situations Brown obtained a small advantage in

[51] G F Arps, "A Preliminary Report on Work with Knowledge *Versus* Work without Knowledge of Results," *Psychological Review,* 1917, Vol 24, pp 449–455

[52] A M Johanson, "The Influence of Incentives and Punishment upon Reaction-time," *Archives of Psychology,* 1922, Vol 8, Whole No 54

[53] W F Book and L Norvell, "The Will to Learn an Experimental Study of Incentives in Learning," *Pedagogical Seminary,* 1922, Vol 29, pp 305–362

favor of informing pupils (by means of a bar graph) of their performance in arithmetic – daily for a 20-day period [54] In a similar situation Panlasigui and Knight obtained a more substantial advantage in favor of this procedure [55] The latter was confirmed by de Weerdt who had obtained significant evidence in favor of the practices of informing fifth grade pupils of their achievement on successive practices in reading, addition, and multiplication [56] Working with senior college and graduate students, Ross compared the relative effectiveness of the following four procedures (1) giving no knowledge as to weekly progress, (2) giving vague information, as good, fair, and poor, (3) giving scores without opportunity to inspect papers, (4) allowing inspection of corrected test papers Within-class groups were formed so that the four methods operated simultaneously within each class Cumulative scores for 12 weekly tests gave no evidence of any substantial differences between any of the four treatments [57]

Some concluding statements The experimental literature presented above with respect to the effectiveness of the expediencies *competition, praise and reproof,* and *knowledge of results* seems to justify them as school practices Their effectiveness doubtless depends upon several factors, notably the aspiration of the pupils Achievement in school must matter to pupils if they are to be moved very much by these incentives It is not essential that a student desire the knowledge and skill offered him in a course of study, although that would be a great help, but it is essential that he desire to learn it It should seem important to the student that he devote himself to the program of education offered by the school These expedi-

[54] F J Brown, "Knowledge of Results as an Incentive in Schoolroom Practice," *Journal of Educational Psychology,* 1932, Vol 23, pp 532–552

[55] I Panlasigui and F B Knight, "The Effect of Awareness of Success or Failure," *Research in Arithmetic,* Twenty-ninth Yearbook, Part II, pp 611–619, National Society for the Study of Education Bloomington, Ill Public School Publishing Co, 1930

[56] E H de Weerdt, "A Study of Improvability of Fifth Grade School Children in Certain Mental Functions," *Journal of Educational Psychology,* 1927, Vol 18, pp 547–557

[57] C C Ross, "The Influence upon Achievement of a Knowledge of Progress," *Journal of Educational Psychology,* 1933, Vol 24, pp 609–619

encies cannot be safely substituted for a fundamental program of advertising, or salesmanship, designed to secure morale, nor for curricula so well conceived as to be of obvious value to the student

On working for marks If the marks earned in a course of study are made to represent progress toward getting an education, working for marks is *ipso facto* a furtherance of the purposes of education If the marks are so bad that the student who works for and attains them misses an education, then working for marks is a practice to be eschewed When marks are given, we are not likely to dissuade pupils from working for them, and there is no sensible reason why we should It simply does not make sense to grade pupils, to maintain institutional machinery for assembling and recording the gradings, while at the same time telling pupils marks do not amount to much As a matter of fact they do amount to something and the pupil knows this If we are dissatisfied with the results of working for marks we might try to improve the marks

INTEREST

By definition, an individual devotes himself to whatever he is interested in An attempt to demonstrate that interest in a subject makes for a more industrious prosecution, other things being equal, is an attempt to prove the obvious Means of generating and sustaining interest is an educational problem of the first magnitude It cannot be solved simply by a trial-and-error search for a course of study that will interest pupils Rather, the task is one of discovering those materials and experiences that will interest them within those areas that are socially, educationally, and culturally useful In practice it more often amounts to interesting the pupil in what he should be interested in If pupils like biography, discovery and exploration, and naval battles and dislike politics and industrial expansion, the problem cannot be settled by the simple expediency of teaching more of the former and less of the latter

Nor can we sit around and await the development of spontaneous interests in a subject before attempting to teach it Perhaps we should await the development of interests appro-

priate to the materials of instruction, but we do not sit around While the background of some pupils is of sufficient scope and quality to lead to a spontaneous interest in many aspects of the school program, that of many others is seriously lacking in this respect This situation is so widespread as to make the supplying of preliminary information, and what may generally be called *background* necessary to the creation and fostering of interests, a major problem in American education, as is shown in Chapter I In all this it is implied, of course, that the teacher will always start with the pupil's existing interests and background, no matter how inadequate they may be

Perhaps we can all endorse the proposition that a pupil will be interested in the pursuit of a subject when it satisfies a personally important need, a felt need It is not required that such a need be socially important to function as a motive, although to be sure it is the business of the school to create a need of socially important content As mentioned in Chapter VIII, there is need of recognition, of a feeling of personal worth and competency, need of response from and security in the esteem of one's fellows, as well as need of consciousness of the worth of the educational efforts expended There is also need of self-respect and of relief from boredom and the monotony of life A pupil takes an interest in those activities that have been found to satisfy these needs An educational enterprise that gives immediate satisfaction of these needs may be expected to have a stronger appeal than one purported to satisfy some future citizenship need Of course, preparation for future citizenship may become an ideal the prosecution of which mediates the gratification of an immediate need, and thus guarantees continued prosecution of the ideal

Intrinsic and extrinsic interest In his excellent paper on interest and effort Dewey emphasized the *propulsive* and the *affective* aspects of interest To be interested in something is to be concerned about it, to be drawn in some degree toward it By the affective aspect Dewey means worth or value The thing or activity in which interest centers seems worthwhile [58]

[58] J Dewey, *Interest and Effort in Education*, p 19 Boston Houghton Mifflin Co, 1913

It is by virtue of these aspects that interests acquire their status as motives We may now inquire whether or not the propulsive and affective aspects of intrinsic interest are greater than those of extrinsic interest An affirmative answer is not self-evident We are really not always able to tell when an interest is intrinsic Dewey's designation *immediate,* in contradistinction to *mediate,* interest is helpful namely, that which "puts itself forth with no thought of anything beyond" But what about interest in activities that afford social recognition, a sense of security, and ego gratification? It is always a question as to the extent to which the latter are present in interests that are ostensibly intrinsic, even in hobbies or literary appreciation

Mediate interest is interest in *means* to an end Dewey's elaboration of mediate interest removes much of the educational importance of the distinction between intrinsic and extrinsic interest A pupil may have no immediate interest in an activity at the outset, but may prosecute it as a means of satisfying another interest But if the end activity satisfies a genuine interest, if it meets a felt need, the mediating activity may in turn become an object of interest That is, as Dewey suggests, the pupil may, if he comes to see the act, thing, or fact "not by itself, but as a part of a larger whole," acquire an interest in the things which are included in the whole "Here, and here only, have we the reality of the idea of 'making things interesting'" The assertion that after subject matter has been selected the teacher should make it interesting "combines in itself two thoroughgoing errors On one side, it makes the selection of subject matter a matter quite independent of the question of interest , and further, it reduces method in instruction to more or less external and artificial devices for dressing up the unrelated materials, so that they will get some hold upon attention In reality, the principle of 'making things interesting' means that subjects be selected in relation to the child's present experience, powers, and needs, and that the new material be presented in such a way as to enable the child to appreciate its bearings, its relationships, its value in connection with what already has significance for him" [59]

[59] *Op cit,* pp 23–24

Every normal person has an intrinsic interest in a feeling of adequacy and personal competence and a sense of security in the esteem of others Success in school, bearing as it does the stamp of social approval, is a means of securing the realization of this interest It is inevitable that this mediate interest, as it is perceived as a means to end, shall become an object of interest Good marks, and attendant approval upon the part of those whose opinions signify much, are rewards at the outset But motives are nothing more than strong, persistent forms of stimulation, and rewards may in turn become motives In other words, an incentive, which originally was a means of eliciting motivated behavior, may, if the rewards are sufficiently strong, become itself a motive [60] The distinction which educational writers frequently make between intrinsic and extrinsic motives is largely without psychological foundation

Another interest a student may have is that of getting an education This desire to be a well-informed and cultured individual or to be successful vocationally may be quite strong, and, happily, one capable of cultivation Those activities which are construed as means of furthering this interest may, as it is strong, themselves become objects of interest The student does not ponder the question of whether the labors to which he addresses himself are intrinsically interesting He probably recognizes that they are in and of themselves less attractive than others he could engage in Rather he asks himself whether or not they further his purpose of getting an education, and, if an affirmative answer is arrived at, plies himself to the task whose interest derives from the larger interest The activity or content itself need not possess such a degree of interest that the student would be drawn to it without the selective factor provided by the larger interest or purpose Indeed a program of education committed to making tasks interesting in and of themselves is likely to lack direction and unity of purpose

Interest and mental development The foregoing leads to the conclusion that interest does not merely lead to mental

[60] *Cf* N E Miller and J Dollard, *Social Learning and Imitation*, Chapter IV New Haven Yale University Press, 1941

development, but is itself conditioned by mental development As James said, "Only what we partly know already inspires us with a desire to know more" [61]

THE PROGRESSIVE EDUCATION MOVEMENT

Any movement that has a large number of followers stands to receive unfavorable advertising from some of those followers Because of its "band-wagon" properties it collects radicals and irresponsible adherents whose utterances have a way of outrunning those of the fathers of the movement To a person who has not taken pains to understand the principles underlying the progressive education movement it is likely to sound pretty bad, unless he be of such a temperament as to be attracted at once by anything that bears the label *progressive* Progressive education is, as some waggish person has said of classical music, really not so bad as it sounds As much cannot be said of some who wave its banner

Progressive education is the titular head, so to speak, of a movement which Dewey was denominating the *New Education* in the eighteen-nineties Perhaps Dewey has had more to do with the development of the movement than any other person, although he credits Colonel Francis Parker (1837–1902) with being its principal originator However, as we should suspect, its roots go back to many educational leaders before them, notably Herbart, Froebel, Pestalozzi, and Rousseau [62] In so far as motivation is concerned, and that has always been at or near the center, progressive education has been chiefly an elaboration of Parker and Dewey This "new education" was child-centered Among other things it allowed the child much greater freedom — freedom of *activity* and

[61] W James, *Psychology*, Vol 2, p 111 New York Henry Holt and Co, 1890

[62] There has since come into being the Progressive Education Association which is committed to the propagation of the principles enunciated by Parker and Dewey, and, of course, like any other educational association, to furthering the cause of education generally Needless to say, there are many progressive teachers who are not identified with the association, some of whom actually oppose it

choice — than did the then traditional school Such terms as *child-centered school* and *activity school* soon came into being

In his lecture "The School and the Life of the Child" (1899) Dewey relates his experiences in trying to find some desks and chairs that were suitable for young pupils One dealer who seemed to discern his problem remarked "You want something at which children can work, these are all for listening" [63] In that day desks were securely fastened to the floor in tightly packed rows The pupils had just room enough to listen, read, and write It was not anticipated that they would do much else The fact that desks were thus fixed was not so bad as what this fixity symbolized Nor did it follow that every school that tore its desks from their mooring immediately became progressive Fixed desks stand for passivity The advocates of the new school recognized the value of *activity* in learning, and, accordingly, demanded freedom of movement and tools with which to work

One of the things meant by the child-centered school is that instruction in school, as in the home and on the playground, should start with the interests of the child The soundness of this program is attested by the fact that it has lived and prospered despite the fact that it has been the butt of enough witty sayings and canards to kill a less sturdy precept [64]

In the hands of a taskmaster the child-centered school would, of course, look foolish It presupposes a different kind of teacher, one who can sense the child's interests, lead him to interests he should have for purposes of getting a useful education, and direct these interests in furthering his mental development Such teachers have not always been available In 1930 Dewey had occasion to complain that "some of these schools indulge pupils in unrestrained freedom of action and speech, of manners and lack of manners Schools farthest to the left

[63] J Dewey, *The School and Society* Chicago University of Chicago Press, 1900

[64] Who has not heard of the lad who having failed, up to the attainment of an advanced grade level, to have acquired a felt need for arithmetic and who upon being discovered in his remission by his pedagogically bent father went to school next day with a burning desire for arithmetic!

(and there are many parents who share this fallacy) carry the thing they call freedom nearly to the point of anarchy" [65] Indeed, one wonders whether the movement has suffered more from some of its friends or from its enemies Even so, the fundamental principles are basically sound, and are acceptable to most American educators

Children have a natural proclivity toward activity In the place of reflection and contemplation, we find activity Activities or occupations should be made the articulating centers of the school, says Dewey — occupations that are engaged in as social activity When the social spirit is present, mutual assistance becomes a virtue "Helping others, instead of being a form of charity which impoverishes the recipient, is simply an aid in setting free the powers and furthering the impulses of the one helped" [66]

The great majority of children of school age like to work and play together Those who do not can ordinarily be brought to this attitude rather easily The stimulus to group activity is a motivational factor of great worth Children like to communicate with each other and interchange ideas and observations They like to make things and do things individually and in groups These normal interests of children can be turned into educational capital of great value

There is a vast difference in the spirit of a class in which the learners are employed individually in executing a formally imposed task and one in which they are engaged collectively in working at a project for which they have had a share in the planning There will, of course, be individual enterprise and responsibility, but the individual contributions are pooled in the spirit of mutual helpfulness

We may give point to the foregoing by seeing how the principles work themselves out in a series of projects in connection with Indian life, an area of concentration that has proved to be very popular in the primary grades This area has been made the articulating core of an entire year's work in some

[65] J Dewey, "How Much Freedom in New Schools?" *The New Republic*, July, 1930

[66] *The School and Society*, p 29

schools The pupils engage in a number of projects centering about the major problems of Indian life, such as food, clothing, shelter, art, religion, language, and sports To prepare food as the Indians in various localities prepared it, to preserve it as they preserved it, to make an article of clothing as they made it, to fabricate and use tools, to tan hides, to make a tepee, as they did, requires the acquisition of a great deal of knowledge There is, however, an important feature in connection with the acquisition of such knowledge the pupils are learning, ostensibly, not for the sake of preparing an assigned lesson, but for the sake of carrying out an interesting project

This interesting and romantic subject, buttressed by the stimulus of a social atmosphere, is to the young learner an end that justifies the means It is fun The activities have meaning and purpose The teacher, of course, has an additional purpose It becomes a means of teaching pupils to read, to express themselves, and to work and live together They read not merely for reading, but to find out This situation affords a natural medium for the teaching of language and art The pupils have something to express and enjoy expressing it What a difference, says Dewey, between having something to say and having to say something For children, says he, language is primarily a social thing It should be cultivated in a social situation

One can hardly imagine a more natural or engaging way of teaching the basic lessons in geography than in studying the mode of life of widely dispersed tribes as it is dictated by the varying geographical conditions of a vast continent Pupils learn about climate, wild life, grasses, trees, rivers, plains, and so on, as they are interdependent upon each other and as they affect the life of man By contrasting the Indian's mode of life with that of our own, the door is opened for the teaching of important lessons about the effect of the impact of culture on the life of man

In the eighteen-nineties Dewey had reason to complain that in the primary grades about 70 per cent of the school time was being devoted to the teaching of the skills Under the aegis of the new education and, subsequently, progressive education,

instruction in the primary grades has been enriched enormously, and this, not at the expense of the skills, for they are actually learned better than formerly

Progressive education has been criticized on the ground that it does not provide the proper elements of discipline This is probably a justifiable criticism of many progressive schools, but it is by no means inherent in the system There is, to be sure, less of submission than under the old regime There is less order also, in the sense that there is more movement and noise, but there is more orderliness of a kind, as the energies of the pupils are directed toward a goal Also some very useful kinds of discipline are provided in cooperation and social living, in overcoming obstacles, in seeing a job through, and in developing initiative in finding and using facts Just as it is true, in general, that the more effective a drug, the greater must be the safeguards put about its use, so also the more effective and refined a teaching procedure, the greater are the care and training required for its use Naturally it is not to be supposed that the teacher should indulge the pupil in his predilection to whittling his desk or singing folk songs at any hour that might suit his fancy

As a final comment upon interests, attention is called to another element in the armour of progressive education, although it is closely allied to the foregoing, namely the utilization of the child's immediate environment for instructional purposes "Make instruction lifelike" has become a shibboleth in education The pupil begins his mathematics, his science, his geography, and so on with problems in his immediate environment There are good reasons for this, but it is a question as to whether the reason usually given is the most valid one If we fail to understand what this is for we run the risk of missing the point in our instruction The child-centered school starts with the child's interests In learning mathematics, for example, it is maintained that his greatest interest is in measuring the objects he has the closest contact with in his environment We should begin with such objects but not necessarily or chiefly for this reason

It is not a foregone conclusion that the child normally has

any greater interest in the physical dimensions of the familiar objects in his environment than in less familiar objects We run the risk of getting the cart before the horse The object of dimensional measurement is to tell how big something is The probability is the pupil already knows, for his own purposes, the size of most objects in his environment before he begins to use mathematics, and as a matter of fact has better knowledge of them than he can gain by mathematics Actually we induce the pupil to apply mathematical measurement to familiar objects not so much that he may learn about the objects as that he may learn about measurement We do not require him to compute the diameter of a tree in his front yard to teach him how big that tree is, but rather to teach him how big is a tree having that diameter He is likely to have greater interest in knowing the size of the trees in the virgin forests of the Pacific Northwest than of the trees in his own yard We teach him the latter as a means of instructing him about the former We do not have him determine the length of the schoolroom because he needs to know how long it is but to teach him how much that length is, and, of course, to teach him how to measure For practical purposes, the pupil knows how big his back yard is or how far it is to school, and his practical knowledge is not furthered materially by his making precise mathematical determinations of each, although his knowledge of 5000 sq ft or a mile may be advanced thereby

While there is no good reason to suppose the student has any great hankering to determine the height of his schoolroom, the width of a near-by river, or the number of acres in the city park, he is, normally, for certain vocational, professional, or cultural reasons, interested in gaining some mastery of the science of mathematics In the lowest grades a pupil may be content with learning to tell how many, at the high school level his interests may extend to algebra, geometry, and trigonometry as they apply to various branches of science There is good reason to provide instruction in mathematics in connection with problems of daily life because mathematics will be more meaningful The pupil will thus be better able to understand the operations and as *he understands them and*

sees their applications he will be more interested in pursuing them

As much may be said of the teaching of science Perhaps there is no place in the curriculum where the project method is so natural and has so great a chance to succeed However, at the high school and college levels the project method is often only simulated Workbooks and manuals have generally served to stifle spontaneity Neither the problem nor the method arises with the pupils It would probably be a fairly rare experience to find a group of students taking counsel with each other on the methodology of an experiment, consulting source materials, advising with their instructor, and planning as a group a scientific procedure Unfortunately some teachers are watchful to prevent such collaboration among their pupils

Question of curriculum organization The foregoing topic necessarily touches upon the question of curriculum organization The point of view presented therein has been taken as a point of departure by the advocates of the so-called *fused* or *unified* curriculum Presumably many variations are to be found One such type of organization abolishes subject matter or course lines, another retains separate courses of study, but attempts to interrelate them, with the social studies, perhaps, as the articulating core [67] The first of these two plans is sometimes called *integrated*, the other, *correlated*, although these terms apparently have other meanings in educational writing For various reasons previously stated there should be some kind of planned interrelationship between the various areas of learning The advocates of what is here termed integration maintain that it permits organization of subject mat-

[67] A sketchy picture of the growth of the curriculum in the elementary school in the United States may be of some interest to the student In 1642 it consisted of the following subjects reading, writing, and Bible, in 1775, reading, writing, arithmetic, spelling, and Bible, in 1875, reading, writing, arithmetic, spelling, conduct, language and grammar, geography, history and civics, drawing, music, nature study, and physical exercises, in 1937, reading, writing, arithmetic, spelling, character education, language and grammar, geography, history and civics, art, music, science, health education and supervised play, industrial arts, home economics, agriculture, and commercial subjects E P Cubberley, *Public Education in the United States*, p 473 Boston Houghton Mifflin Co , 1934

ter in terms of problems that are in keeping with the pupils' interests Thus, it is better adapted, so it is maintained, to a child-centered procedure The advocates of correlation insist that there are certain educational virtues to be derived from the organization of learning experiences into definite courses of study Logical organization, historical continuity, and instruction in methodology and a scientific spirit are among the virtues claimed for organization of the curriculum along course lines There appears to be good reason in both positions Perhaps at the high school level the advantages accruing from course organization, where students are expected to take on something approaching scholarly attitudes, are sufficiently great to swing the weight of argument in that direction [68]

A reason for integration, correlation, etc is that knowledge gained in connection with one topic may the better serve as a basis for understanding another topic Course lines do not have to be broken down in order to accomplish this end But it may be better accomplished when it is realized that the knowledge gained in one course serves as appercептive aids in the acquisition of knowledge in another, if, of course, this realization leads to closer correlation

Naturally, this is not the place to attempt to reach a decision about the merits of the integrated curriculum, although it is fitting to comment upon it in so far as psychology has anything to contribute to the issue Some of the legitimate psychological advantages have been indicated However, some of the less critical advocates of integration have employed a quasi-psychological argument in defense of their contention – one that reflects an uncritical type of thinking so widespread that it deserves special comment namely, the argument that our aspirations for integrated personality can best be realized by an integrated curriculum It would be about as logical to contend that we should have an integrated curriculum because Henry Clay "would rather be right than be president" This kind of nonsequitur is what Dewey had in mind when he complained that enforced discipline – enforced order and obedience –

[68] *Cf* W G Reeder, *A First Course in Education* New York The Macmillan Co , 1943

does not lead to self-discipline Everything that passes by the name *discipline* is not the same Military discipline, which is perfectly good in its place, does not lead to self-discipline, a disciplining of the mind or character Enforced obedience of a military or school code probably does not in and of itself contribute anything to voluntary respect for such a code It may have just the opposite effect

In just this same sense it should be observed that everything that passes by the name *integration* is not the same thing There are many kinds of integration, and that very euphonic term *integrated personality* has no standard meaning, beyond the rather hazy notion that it is a good thing But one can scarcely imagine any meaning that "integrated personality" could have that would have much to do with "integrated curriculum" Had different words been used for either the phenomenon designated by "integrated personality" or that designated by "integrated curriculum" the two would probably never have been conceived as having anything to do with each other The argument that integration is demanded by the dictum that the whole is greater than the sum of its parts, etc is just as chimerical It is, even so, a lot funnier

I remember hearing of a day's lesson in a certain over-correlated city The subject was the crow The children studied the crow read about him, drew him, wrote about him, counted him, added, subtracted, multiplied and divided him, bought and sold him, and for aught I know, carried him out on a crowbar [69]

[69] C B Gilbert, "What Correlations of Studies Seem Advisable and Possible in the Present State of Advancement in Teaching," *Proceedings*, National Educational Association, 1896, Vol 35, p 299

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